JUNE, 1961

Plant Engineering®

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The magazine that helps plant engineers with their everyday problems

Volume 15, No. 6 Circulation of this issue 52,151

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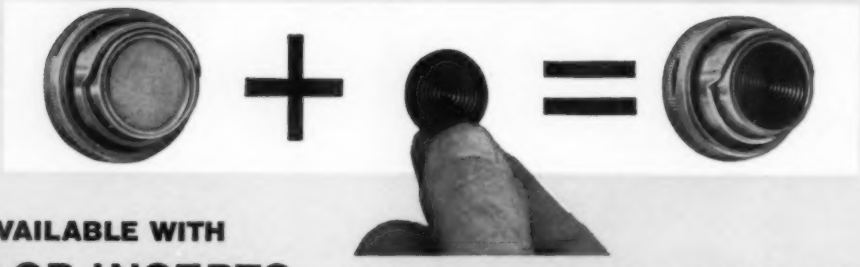

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7 colors available • Choose from black, red, green, brown, yellow, orange, blue.

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A COMPLETE LINE OF OIL-TIGHT OPERATORS

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Circle 501 on postcard, page 33

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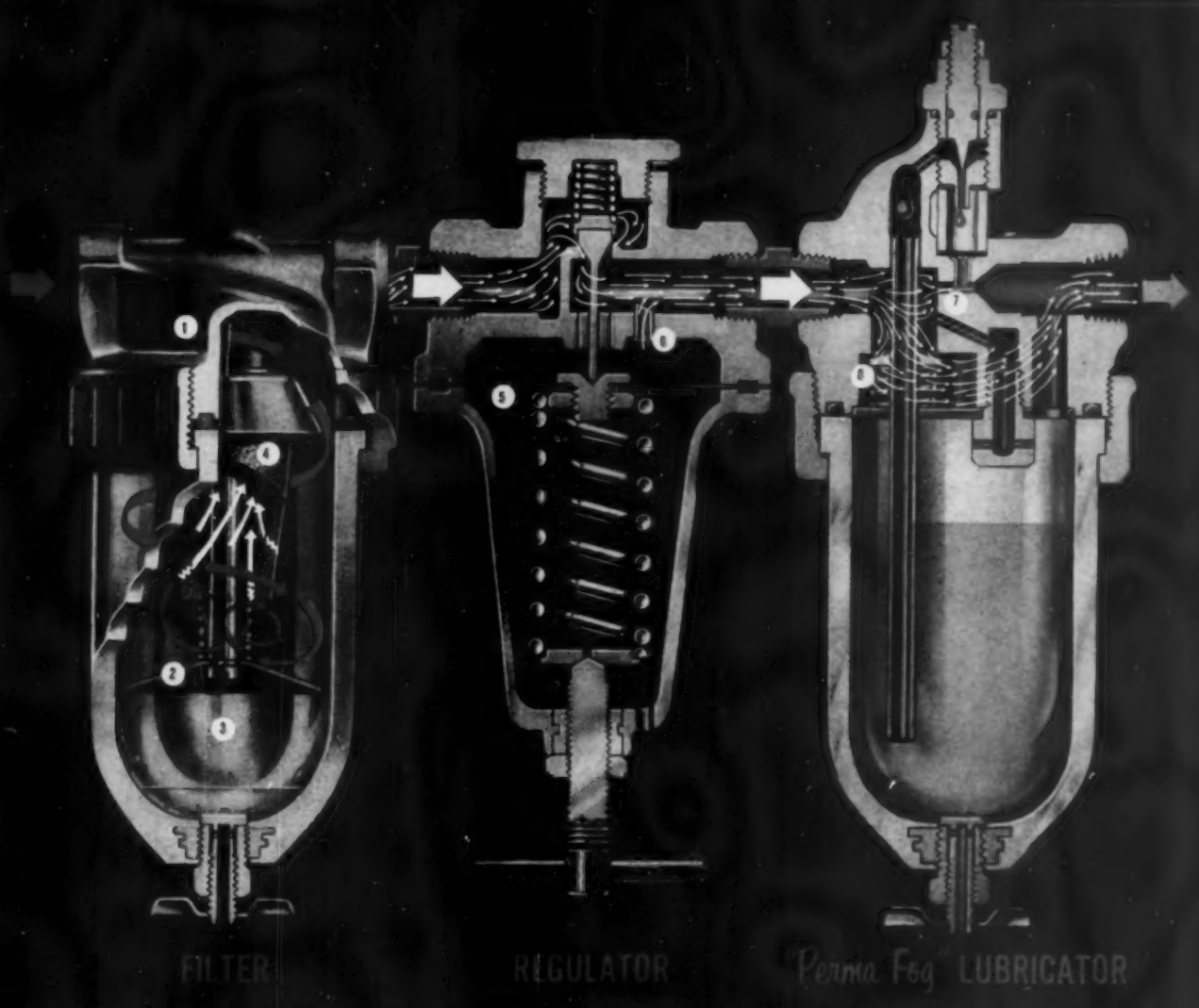

Curved inlet ❶ directs incoming air in downward helical pattern. Larger impurities and condensate are "thrown out" by centrifugal action, collecting on bowl sides and spiraling downward past baffle ❷ into quiet chamber for draining off. Baffle traps sediment in quiet chamber ❸ and allows only dry air centrifugally cleaned of larger impurities to reach porous bronze filter element ❹ where finer particles are filtered out.

Diaphragm of large area ❺ is of BUNA-N—imparts extra sensitivity for response to even minute reduced pressure variations. Aspirator ❻ acts directly on diaphragm, providing instant compensation for fluctuating loads . . . assures precise control and stabilizes pressures reaching individual pieces of equipment.

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Plant Engineering June 1961, Volume 15, No. 6

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'ROUND ABOUT with the editors

Edited by R. L. Marinello

Named Plant Engineer

Don Phillips has been promoted to plant engineer at the Houston plant of the National Supply Division of Armco Steel Corporation.

He started with the engineering department at Houston in 1957 and was later made assistant development engineer. He succeeds **R. R. Sloan,** who resigned.

Study Courses on Process and Digital Control Systems

AN INTENSIVE three-week summer study course in Process Control Theory will be offered at Case Institute for practicing engineers in the modern techniques of automatic control equipment from July 10 to the 29.

Participants will have an opportunity to study the derivation of the mechanical behavior of a system to be tested in the laboratory, where dynamic tests will be run on control equipment applied to typical control processes.

A two-week summer course in Digital Control System engineering will be held from July 31 through August 11. Specific attention will be placed on military guidance, control and data systems, industrial numerical process control systems and new process systems with numerically-controlled machines.

For further information about these courses and requests for applications, address your inquiry to Mr. Herbert Schultz, Manager of Special Programs, Case Institute of Technology, University Circle, Cleveland 6, Ohio.

Engineering Changes at Condec

Everett S. Winslow, formerly plant superintendent at Consolidated Diesel Electric Corporation, Stamford, Connecticut, has been named superintendent of Condec's new assembly plant in Schenectady, New York.

Alphonse J. Stanczyk will replace Winslow at the Stamford plant. He will be in charge of all fabrication, assembly, maintenance and carpentry functions.

Winslow joined the company in April, 1960. Previously he had been chief industrial engineer for the automatic pinsetter division of Brunswick Corp.

Prior to taking his new position with Condec, Stanczyk had been a divisional manager with Clark Equipment Company in Buchanan, Michigan. He is a mechanical engineering graduate of the University of Notre Dame.

Another Notch on Our Quill!

PLANT ENGINEERING's editors were pleased to hear that the magazine has again been selected by the National Safety Council to receive one of their Public Interest Awards for 1960.

We are happy to have done our part, through the pages of PLANT ENGINEERING, to call safety and safety practices to the attention of our readers. We will do our very best to continue to merit this recognition.

Q and A About Radiation

WHAT IS nuclear radiation? How does radiation cause damage? Can radiation injuries be cured? These and many other questions are answered in the booklet recently published from material collected by the United States Atomic Energy Commission.

The booklet "18 Questions and Answers About Radiation" may be obtained by writing to Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price of the booklet is 25 cents.

Industrial Building Congress

IF YOU ARE in the process of building a new plant or contemplate such a project in the near future, then you will be interested in attending the Industrial Building Exposition and Congress. It will take place at the New York Coliseum from September 25 through 28.

Topics to be discussed at the conference portion of the program will be directed to three types of audiences. These include companies which have a continuing program of building new plants; companies which rarely build new plants but have one planned or under consideration; and companies which have problems of modernization.

Further information about the specific subjects to be discussed at the conference will appear in a later issue.

Exhibits will cover eight major categories. These include structural materials and components; mechanical components and equipment; electrical

Subscriptions: U.S.A. $10. Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by the 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Milwaukee, Wis.

BPA NBP

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ALWAYS LOOK TO NATCO

for the complete line of genuine structural clay tile products

CERAMIC GLAZED VITRITILE

Vitritile provides attractive, sanitary, permanent interiors that require little maintenance. Available in a variety of colors—ceramic, clear and speckled glazed finishes. Complete shapes and fittings furnished.

Tile face sizes
8W Series—7¾" x 15¾"
6T Series—5⅛" x 11¾"
4D Series—5⅛" x 7¾"

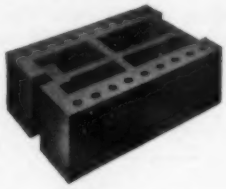
Nominal thicknesses
2", 4", 6", 8"

CERAMIC GLAZED NATCOUSTILE

A structural perforated face unit, designed for walls and partitions where acoustical sound absorption is desired. Available in the standard ceramic glazed field shades.

Tile face sizes
8W Series—7¾" x 15¾"
Random pattern
6T Series—5⅛" x 11¾"
Uniform pattern (shown)

Nominal thickness
4"

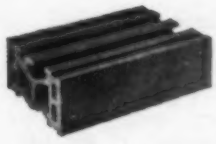


UNIWALL FACING TILE

A structural clay load-bearing unit with an unglazed, buff rugg-tex *exterior* finish and a ceramic glazed *interior* finish. Designed for single unit complete wall construction.

Tile face size
3⅝" x 11⅝"

Thickness
7¾"

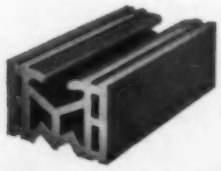


TEX DRI-WALL TILE

For single unit wall construction in commercial and industrial buildings of all types. Available in red or buff velour texture. Gives the appearance of high quality face brick at moderate cost.

Tile face size
3⅝" x 11⅝"

Thickness
7⅝"



DRI-SPEEDWALL TILE

Designed for complete load-bearing nominal 8" wall construction . . . completely fireproof and impervious to moisture. Furnished in Buff Unglazed, Salt Glazed and Red Textured finishes.

Nominal face size
5⅓" x 12"

Nominal thickness
8"

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Speedtile	Combination floor tile
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Backup tile	Clay drain tile
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Unglazed facing tile	Vitri-seal pipe
Ceramic glaze Vitribrik, "4S" series	Wall coping tile
	Clay stove liners
Fireproofer tile	Flashing tile
Patio tile	Chemtile
Stairtread tile	Kiln floor brick
Face brick	Natsol solar screens

Write for general catalogs S-61 and SB-61

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Syracuse 3, N. Y., 1045 James St., Tel. Granite 9-8222
Clay Pipe Sales Division, P.O. Box 207, Brazil, Ind., Tel. Brazil 3-1531
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Circle 503 on postcard, page 33

TURN SCRAP HANDLING INTO A PROFIT!

Segregated scrap brings higher prices. Add the convenience of easier collection and easier handling, and in most cases you can convert scrap handling from a loss to a profit.

DUMPS ITSELF

RIGHTS ITSELF

LOCKS ITSELF

Hundreds of industries now use Roura Hoppers to collect scrap metal. They're placed alongside machines or in strategic locations. When full, a lift truck picks up the loaded hopper . . . transports it to scrap bin or freight car . . . flips the latch . . . and the hopper *automatically* dumps itself, rights itself, locks itself.

Roura Hoppers are made in eight standard sizes . . . in ⅓ to 4 yard capacities. Ruggedly built of 3/16" steel plate with continuous arc-welded seams, the hoppers give years of continuous service. Heavier plate, stainless, aluminum or galvanized is also available if desired. Standard models shipped from stock.

Specifications are available without obligation. Phone us collect at Townsend 8-3560 or use the handy coupon.

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Self-Dumping
HOPPER

WANT MORE DETAILS? Just clip this coupon to your letterhead, sign your name and mail to:

ROURA IRON WORKS, INC.
1413 Woodland Ave., Detroit 11, Mich.

Circle 504 on postcard, page 33

'ROUND ABOUT

components, materials and systems; heating and air handling; employee services; plant sites and services; financing; and the auxiliary services in a plant.

Advance registration cards may be obtained by writing to Clapp and Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Appointment at U.S. Steel

Thomas A. Watson has been appointed division superintendent-plant maintenance at the South Works of the United States Steel Corporation, Chicago, Illinois.

Mr. Watson replaces **Charles E. Genovese** who has recently retired as division superintendent-plant maintenance after serving with the company for 45 years.

Vern Keeps Busy With Electronics

When the "hi-fi" bug bit Vern Kempf, our electrical editor, he naturally decided to build his own rig.

Vern connects wire in half-finished amplifier. He has already completed the preamplifier and the FM tuner.

As sound reproduction is a special branch of electronics, Vern took a short course in High Fidelity Sound Reproduction at DeVry Technical Institute before starting work on his rig.

Working with Harmon-Kardon kits, he has completed an F-M tuner and a stereo pre-amplifier and is now in the process of building a 120-watt stereo power amplifier.

Lockheed's Plant Engineering Department's Men-of-the-Year

Forty members of the plant engineering department of Lockheed Aircraft Corporation, Marietta, Georgia, gathered at an annual meeting in February to honor **E. C. Brown**, engineer-of-the-year and **R. M. Boston**, supervisor-of-the-year.

E. C. Brown, a mechanical engineer in buildings engineering, and R. M. Boston, mechanical maintenance, received personalized desk sets in recognition of their achievements.

E. J. Docekal, plant engineer, was the guest speaker. In reviewing accomplishments of the past year, he praised the degree of cooperation among plant engineering personnel and the esprit de corps of the entire group.

Brown, left, accepts desk set from Jim Denny, Jr., manager of buildings engineering. Seated are J. Horner and T. Renshaw, retired employees.

Boston, left, receives personalized desk set from his manager, A. L. Rambo. Seated, l to r, are J. Bishop, and Emil J. Docekal, plant engineer.

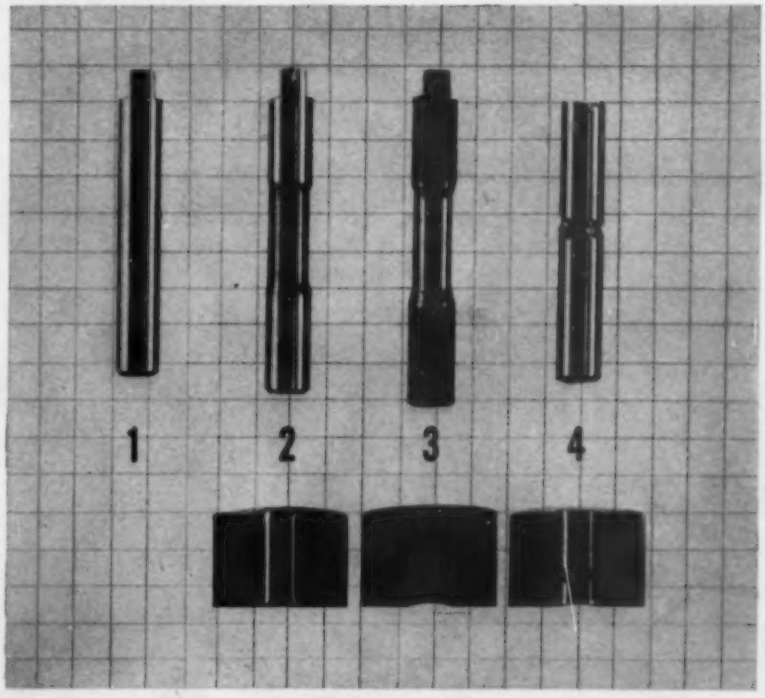
CLIMAX MOLYBDENUM

Molysulfide® News Digest

CLIMAX MOLYBDENUM COMPANY, a division of American Metal Climax, Inc., 1270 Avenue of the Americas, New York 20, N.Y.

RECENT TEST SHOWS MORE PROOF OF MoS_2's LOAD-CARRYING ABILITY

From the German laboratory of Alpha Molykote Corporation comes new proof of Molysulfide's ability to resist galling and seizing at pressures beyond the yield point of most metals. Previous tests have shown that MoS_2 sustains loads up to 475,000 psi. In this Almen Wieland test, similar to the Falex test, a ¼" pin actually extruded *without any surface damage* at pressures of 100,000 psi, while similar pins using other lubricants were torn, galled or "frozen" to the point of breakage.



The photo above shows mild steel pins used in Almen Wieland test. No. 1 is unused Control Pin. No. 2 (lubricated with mineral oil and MoS_2) and No. 3 (with MoS_2 bonded coating) were elongated and extruded without weight loss. No. 4 shows typical failure with conventional lubricant. Note that the key sheared off and that pin and block were galled and seized. Surveys of many laboratories indicate that the extrusion phenomenon exhibited by No. 2 and No. 3 pins has never been produced with any other conventional lubricant.

As a result of Molysulfide's unique pressure-sustaining ability, MoS_2 is widely used as a "break-in" lubricant which prevents abrasion and seizing, permits shorter "break-in" runs, and prevents bearing damage when boundary lubrication occurs.

When writing, refer to CL-107

New Teflon-MoS_2 Bearing Component Withstands Temperatures Up To 575°F

A new precision ball bearing, which operates at temperatures up to 575°F and needs no conventional lubrication, is now coming off the lines at the Barden Corporation's plant in Danbury, Conn. Trade-named BAR-TEMP, the new bearing utilizes a ball retainer of reinforced Teflon compounded with "Moly" lubricant. Resistance to deformation is much higher than that of pure Teflon*. Also, the material serves as a *dry lubricant*. As the bearing rotates, microscopic amounts of Molysulfide rub off and are deposited on the raceways. Result: superior lubrication and far longer bearing life.

Successful applications include synchros, fans, motors, blowers, barometic pressure switches, tachometer generators, and other devices operating from 1,000 to 24,000 rpm, at temperatures ranging from –100°F to 575°F.

*T.M. E. I. du Pont de Nemours & Co., Inc.

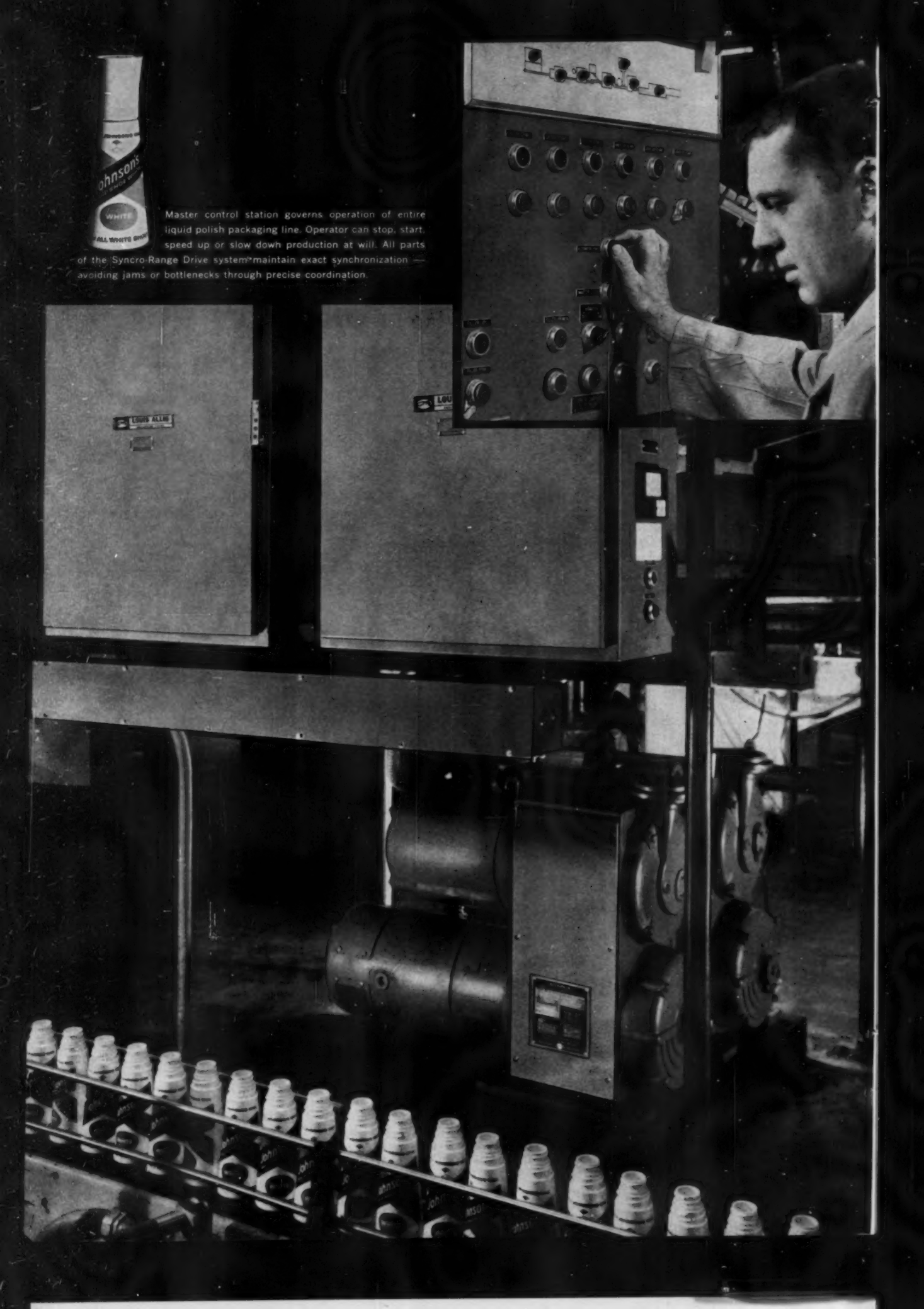
When writing, refer to CL-105

"Moly" GIVES WIRE ROPE 45% MORE BENDING LIFE

That's the forthright verdict of one of the leading wire rope manufacturers, which recently tested its MoS_2-lubricated wire rope against four other leading brands. Fatigue tests and field tests demonstrated the rope's ability to outlast other premium wire ropes in service.

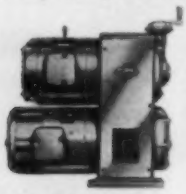
Used as an ingredient in wire drawing compound, Molysulfide creates a micro-shield around each wire. This smooths out minute surface imperfections and prevents the wires from grinding together as the rope flexes. Result: reduction of internal friction —better resistance to fatigue—far longer rope life.

When writing, refer to CL-106



Master control station governs operation of entire liquid polish packaging line. Operator can stop, start, speed up or slow down production at will. All parts of the Syncro-Range Drive system maintain exact synchronization — avoiding jams or bottlenecks through precise coordination.

The key components of the Syncro-Range Drive...



Adjustable Frequency Power Supply . . .

. . . and Standard or Syncro-Spede Motors!

LOUIS ALLIS SYNCRO-RANGE DRIVES automate liquid polish lines

Johnson's Wax, renowned wax and polish producer, uses Syncro-Range Drives for exact control of process lines

Controlling speed of the precise, mass-production lines for their new, highly successful liquid shoe polish was the task Louis Allis engineers had to solve for Johnson's Wax.

The problem was to time the flow of plastic bottles, liquid polish, wool daubers, and caps into the packaging lines at precisely equal rates. Flow rate must be adjustable so the lines can be slowed down or speeded up. And the entire packaging operation must be controllable from a single master control. The Louis Allis Syncro-Range Drive solved the problem.

Syncro-Range Drives provide synchronized speed of any number of motors from a single control. It is a "packaged system" comprising an adjustable-frequency power supply operating on 3 phase, 60 cycle power input . . . a group of Syncro-Spede® synchronous motors which maintain exact synchronism regardless of varying load . . . and a control which permits the speed of the entire group of motors to be simply adjusted without losing synchronization. On applications for which exact synchronism is not required, standard squirrel-cage motors can be supplied.

You can readily see the advantages of the Syncro-Range Drive in systems or processes which require synchronized movement: multiple conveyors which feed consecutively; transfer lines; process lines; assembly lines requiring coordinated arrival of components; printing where one press feeds another; synthetic fibre spinning, drawing, or twisting; metal runout tables; and many other similar continuous-process machines which require the application of power at a number of points on the machine.

The Syncro-Range Drive is available with a choice of drive sizes to efficiently control from 2 to 200 (or more!) standard or Syncro-Spede motors of the same or different horsepower ratings. The Syncro-Spede motor is an A-C synchronous induction motor without slip rings or D-C excitation. It requires no more upkeep than a standard, squirrel-cage motor and can be supplied in open drip-proof, enclosed, or explosion-proof enclosures with mechanical modifications to match your requirements.

A sophisticated selection of control features are available in the system, including motor starters, main line circuit breaker or fusible disconnect switch, speed adjustment, speed indicator, remote control, and automatic control governed by temperature, pressure, or flow sensing devices. Controls can provide speed regulation accurate to 0.1% with 0% relative speed difference between motors!

Investigate the application of the Syncro-Range Drive system to *your* process. A trained Louis Allis motor application engineer is always available. You can reach him at your local Louis Allis District Office, or by writing direct to The Louis Allis Company, 434 East Stewart Street, Milwaukee 1, Wisconsin.

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

LOUIS ALLIS

A59-231

Circle 506 on postcard, page 33

HELPFUL WATER CONDITIONING DATA FROM BETZ

HOW TO PREVENT BOILER

■ Troubled with boiler scale? A modern scientific approach will eliminate the problem.

THE FORMATION of scale and sludge deposits on boiler heating surfaces is the most serious problem encountered in steam generating equipment. Blistered boiler tubes and tube failures cause boiler outage and loss in production. In extreme cases, complete shut-down of an entire plant can result.

Through the years, industrial plants have found it more economical to generate steam at higher and higher pressures. At the same time, heat transfer rates have increased to aggravate further the problem of scale and deposit formation. Water treatment technology has kept abreast of these increasing demands by developing more effective external and internal treatment methods.

Softening Process	Residual Hardness, ppm
Cold Lime-Soda	30-50
Hot Lime-Soda	15-25
Hot Lime-Zeolite	0-2
Zeolite	0-2
Sodium-Hydrogen Zeolite	0-2
Demineralizers	0-0.5

Figure 1

Figure 1 lists the more common external treatment methods that are employed and the range of residual hardness that usually results. The selection of the method of external treatment is governed by the operating pressure, water characteristics, economics and other factors. Obviously, the higher the operating pressure the more complete must be the job of external conditioning. However, no system of external treatment is in itself adequate protection against boiler scale without the use of supplementary internal chemical treatment of the boiler water. Even the small amounts of hardness present in the effluent of zeolite softeners will produce troublesome deposits.

Mechanism of Scale Formation

Basically, scale formation occurs because the solubility of the scale forming salts decreases as temperature increases. Consequently, the higher the temperature (and pressure) of boiler operation, the more insoluble become the scale forming salts. The chief mechanism of scale formation is the result of crystallization of the scale forming salts from the thin, viscous film of boiler water adjacent to the heating surface where the bubbles of steam originate. The generation of steam bubbles produced by vaporization of the water film causes the dissolved substances in the film to concentrate. Consequently, the solubility of the scale forming salts is first exceeded in this thin film rather than in the main body of the boiler water. The salts with the least solubility will crystallize out first and scale will form on the tube surfaces even when the solubility of the scale forming salts is not exceeded in the boiler water proper.

The calcium and magnesium salts are primarily responsible for scale deposits. With untreated boiler water calcium silicate, calcium sulfate and calcium carbonate will crystallize on the tube surfaces as a hard adherent scale. Magnesium salts deposit primarily as magnesium silicate and magnesium hydroxide.

Prevention of Scale

Prevention of the crystallization of scale-forming salts from the thin film adjacent to the heat transfer surface is accomplished by precipitating the calcium and magnesium salts in the main body of the boiler water in their least soluble form. As a result, the concentration of calcium and magnesium in the film will be negligible. To accomplish these results, calcium is precipitated as the phosphate and magnesium as the hydroxide and/or silicate. These precipitates can settle and bake on the heat transfer surfaces in the

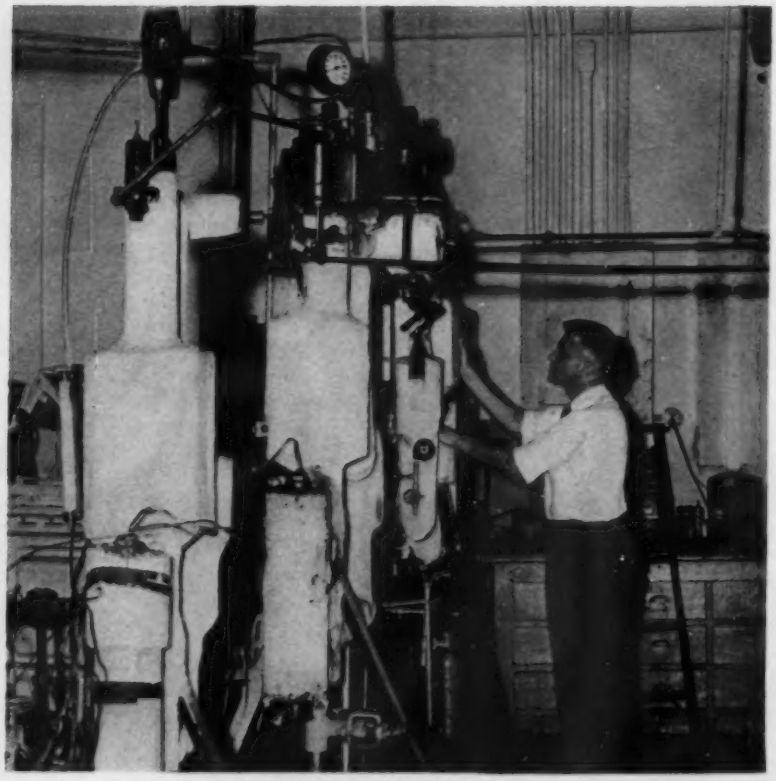
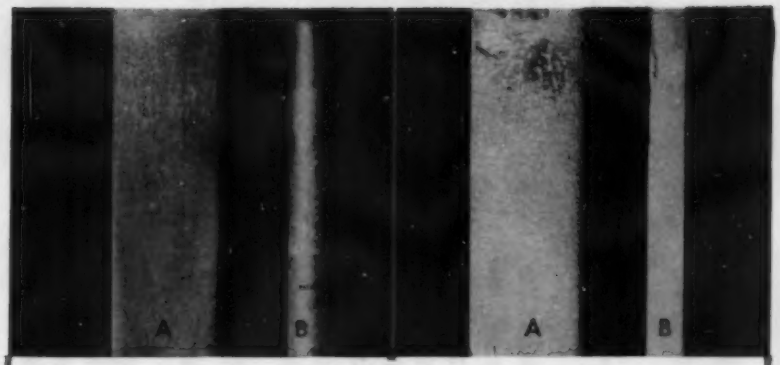


Figure 2—Experimental boilers.



Deposit, grams per sq ft.

With Sludge Conditioner		Without Sludge Conditioner	
A	B	A	B
0.03	0.12	1.20	5.80

Heat transfer A=28,000 Btu/sq ft/hr; B=180,000 Btu/sq ft/hr

Figure 3

DEPOSITS

form of objectionable deposits, unless they are maintained in a dispersed form as a fluid, non-adherent sludge. Accordingly, further conditioning of these precipitates by organic dispersing agents serves to convert them to a sludge that can be removed by boiler blowdown.

Organic Sludge Conditioners

Starches, tannins, lignins, colloids and other organic agents possess to a varying degree the ability to maintain calcium and magnesium precipitates dispersed in the form of sludge. The ability of various organic agents to accomplish sludge conditioning has been the subject of extensive research. At Betz Laboratories, specially designed experimental boilers such as those shown in Figure 2, are used to develop the most stable and effective sludge conditioning agents available.

These experimental boilers are equipped with feed systems, water level control, blowdown and the safety devices necessary for continuous, automatic operation. The heat input is accomplished by electrical heating elements which serve as the scaling surfaces and have heat transfer rates ranging between 28,000 to 180,000 Btu per square ft. per hour. Figure 3 shows the low and high heat transfer scaling surfaces from a duplicate experiment with and without the use of an organic sludge conditioning agent. The effectiveness of the organic sludge conditioning agent is readily evident.

Other Deposits

Another source of concern is silica. Complex silica deposits, which may or may not include calcium and magnesium in their structure can occur in boilers operating at high pressures and at high heat transfer rates. The silica tolerances for various boiler operating pressures have been well established for prevention of boiler scale and for prevention of silica vaporization with the steam.

Blowdown can be used to control silica concentrations to the proper tolerance levels. When excessive blowdown is required, external silica removal processes should be employed to restrict boiler water silica concentrations within established limits.

The concern for silica is not always because it is too high. In some cases silica can be too low. This situation occurs primarily with waters that contain high magnesium concentrations and low silica values. In these special cases magnesium will tend to precipitate as magnesium phosphate which produces a sticky sludge. Precipitation in this form is aggravated when the feedwater enters in a region of low alkalinity and poor circulation. Under these conditions, increasing the silica content of the feedwater to avoid magnesium phosphate precipitation will prove helpful. However, this practice must be applied within the normal silica tolerances established for the boiler operating pressure. Other factors that must be considered are increased boiler water alkalinity, the use of special organic sludge condition agents and better mixing of the feedwater.

Iron Oxide Deposits

Deposits consisting predominantly of iron oxide are frequently found in boilers operating with very pure feedwater. In such plants, the makeup water requirements are usually low. The usual sludge forming calcium and magnesium salts may amount to less than 5% of the boiler deposit. The origin of such deposits can usually be traced to corrosion external to the boiler. Corrosion of iron or steel in the condensate or preboiler system will permit substantial amounts of dissolved iron to enter the boiler where precipitation will occur as a result of the higher temperature and alkalinity conditions of the boiler water. Prevention of iron oxide deposits originating from corrosion external to the boiler can most effectively be controlled by eliminating the condensate corrosion problem. The materials most commonly employed for this purpose are the neutralizing or filming amines. Where carbon dioxide concentrations are low and dissolved oxygen negligible the neutralizing amines will prove effective and economical. Where carbon-dioxide concentrations are high the use of the filming amines will prove more effective and economical.

Iron oxide deposits originating from attack of the boiler metal can also result. One special case of such attack occurs from steam blanketing. The water and steam oxidize the hot steel to black magnetic oxide at hot spots in the boiler. These problems are associated with extreme heat input and faulty or low circulation and usually lead to tube failures.

Betz research has produced the products and know-how to handle all phases of your boiler water conditioning problems effectively and economically. If you would like additional information regarding Betz service at your plant, we will be happy to have you write us. Why not do it *today?*

BETZ LABORATORIES, INC.

PHILADELPHIA 24, PENNSYLVANIA

BETZ

■ CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

GOODYEAR

EXCLUSIVE! GOODYEAR GREEN SEAL V-BELTS

to give you sets that are precision-matched in length to outperform...and outlast...all others

At no extra cost, GREEN SEAL *V-Belts also give you:*

Dimensional stability throughout the life of the belts via highly shrink- and stretch-resistant 3-T Process Cord or airplane-type steel cable.

Protection against dampness through special mildew-inhibited rubber compounds.

The most complete line of V-Belts in the industry—easily and quickly available through our nationwide network of distributors.

Still another "plus": The G.T.M.—Goodyear Technical Man—is available to help you select the right belts for any drive.

For your best buy in multiple drive belts—including new money- and space-saving HY-T Wedge V-Belts—look to Goodyear. Also, get the full story on P.D. (positive drive) Belts and Variable Speed Belts from your Goodyear Distributor. Or write Goodyear, Industrial Products Division, Akron 16, Ohio.

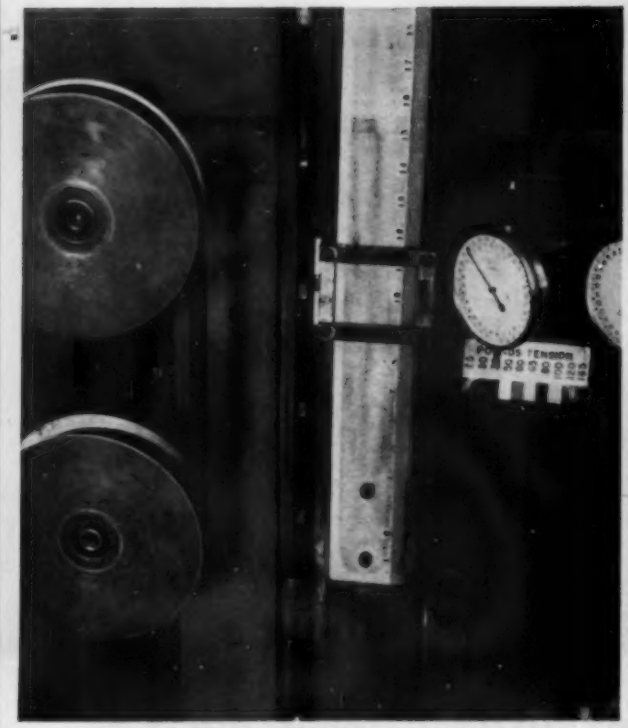
Lots of good things come from

GOODYEAR

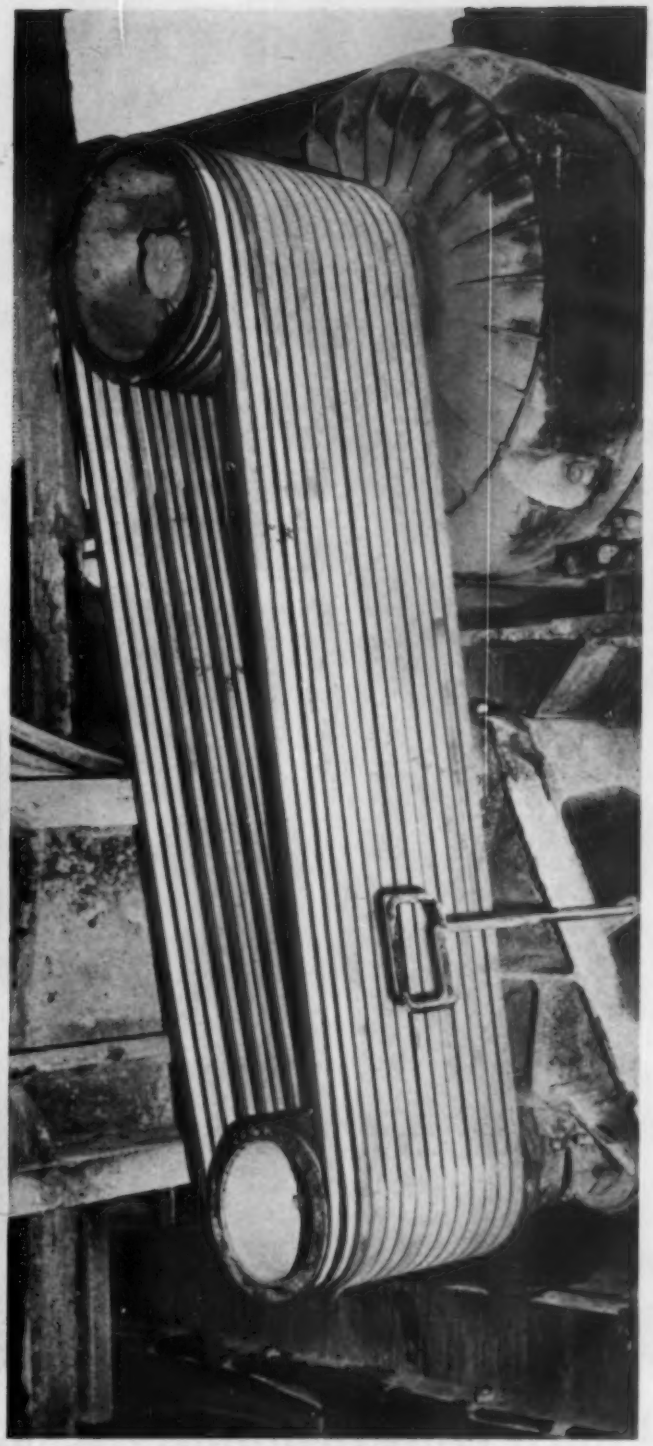
INDUSTRIAL PRODUCTS

Compass, Green Seal, Hy-T, P.D.—T.M.'s
The Goodyear Tire & Rubber Company, Akron, Ohio

CODES TO 1/32"...



Length-coding GREEN SEAL V-Belts to 1/32"—not just 1/10" like most belts—takes this ultra-precision machine. *Only* Goodyear has this type of equipment, which is set by means of fine-tolerance steel templates to insure accuracy.



Harnessing this big, 22-saw stonecutter for 3 full years required COMPASS-V-Steel Belts by Goodyear. Over this period, the Goodyear belts helped carve up 20 tons of rock a day—over 15,000 tons in all. Normal V-belt life in this type of rugged service is a scant 6 months.

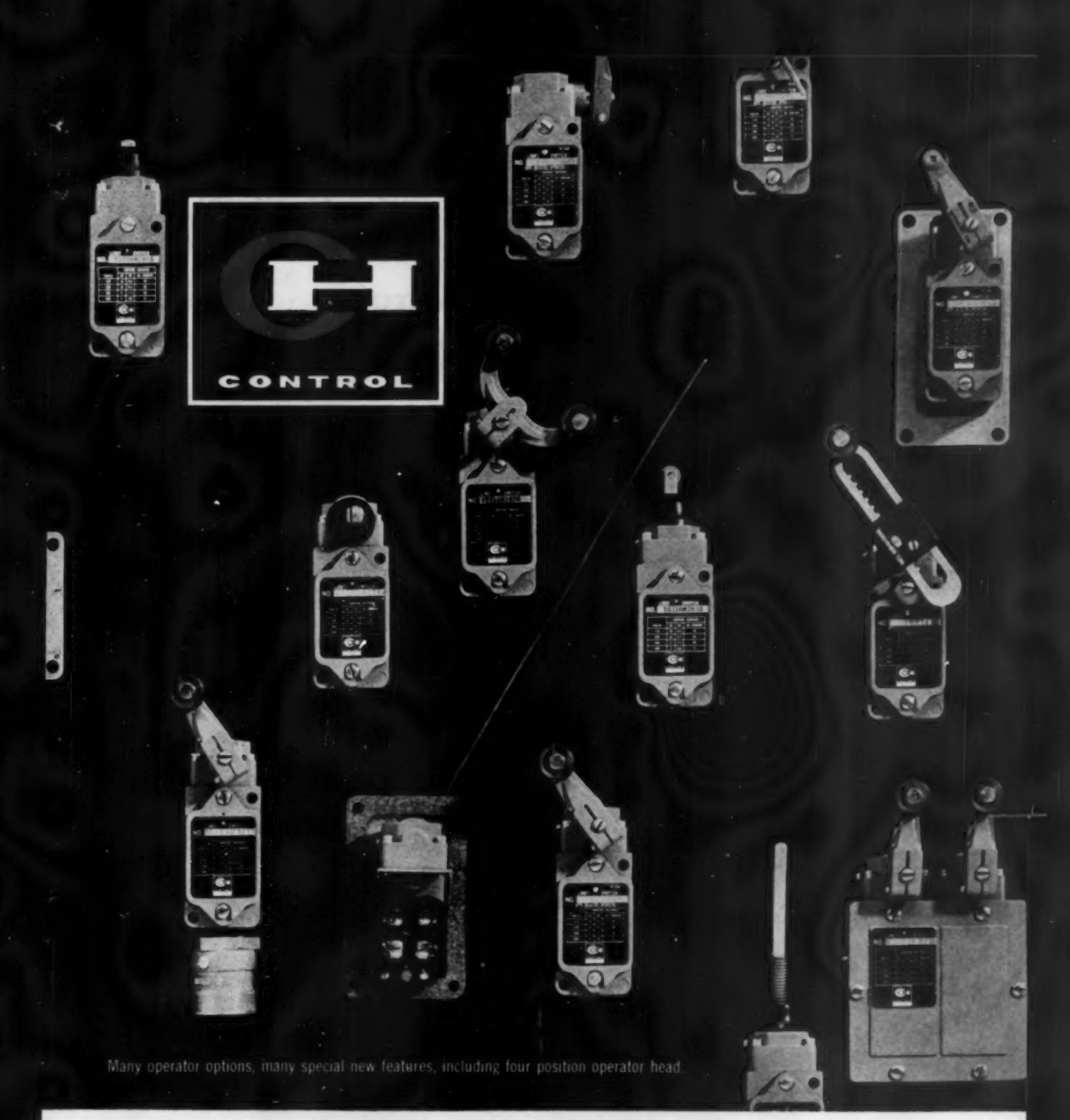
Circle 508 on postcard, page 33

What's your problem? If you can solve it with a

New Cutler-Hammer operator options provide top flexibility... world's best oiltight limit switch

For any use, anywhere, in any position . . . you just can't buy a more reliable, longer-life switch. No other switch is sealed more effectively . . . effectiveness we've proved under test conditions so rugged they will never be equaled in actual service. Even the silver-to-silver contacts are visible for quick inspection. For full details on this complete new line, write for Pub., ED-145-L274.

For any electrical control problem, contact your local Cutler-Hammer sales office or distributor. They'll supply you with the finest electrical components, the finest service and technical help.



Many operator options, many special new features, including four position operator head.

limit switch, your best answer's here!

WHAT'S NEW? ASK...

CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wisconsin • Division: Airborne Instruments Laboratory • Subsidiary: Cutler-Hammer International, C. A. • Associates: Cutler-Hammer Canada, Ltd.; Cutler-Hammer Mexicana, S. A.

CONTROL

Circle 509 on postcard, page 33

Otis

WORLD'S WORD FOR ELEVATOR QUALITY

DOLE USES OTIS FREIGHT ELEVATORS in its production line to move canned pineapple to storage after processing. They transport 275-million cans a year. Since 1953, DOLE has protected this vital production capacity with dependable OTIS elevator maintenance. Is elevator maintenance complex? Yes! It is an organization task requiring an unusual combination of skills. Plus a wide knowledge of parts, assemblies, functions, replacement procedures, testing and adjusting. Plus the availability of original replacement parts. Plus immediate service in emergencies.

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N.Y.
OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

Dole

WORLD'S LARGEST FRUIT CANNERY

275,000,000 CANS OF PINEAPPLE PRODUCTS are grown, processed and packaged each year by DOLE. This fruit, picked from 30,000 nearby acres, amounts to 40% of Hawaii's output. DOLE requires only 15 minutes to process a pineapple once it has entered the cannery. Growing a pineapple is a much slower process! It takes between 18 and 24 months for a new plant to produce a mature fruit. Each year, 100-million slips are planted by hand. One man inserts about 8,000 slips into the ground in an 8-hour day.

Circle 510 on postcard, page 33

This is AMERICAN OIL COMPANY

AMERICAN

A sales organization especially trained to serve industrial and fleet customers . . . 74 District Offices and 13 Regional Offices . . . 4,100 warehouses and distribution points . . . 12 refineries . . . more than 2,000 products to serve you . . . this is American Oil Company.

The American Oil Company representative who calls on you receives special training in servicing industrial and fleet customers at our Sales Engineering School. His training begins with a concentrated course in petroleum product quality and application. According to a planned schedule, he returns for an advanced course and then again for post-graduate work. From our Marketing Technical Service Department, your American Oil representative draws assistance, when needed, from specialists who are recognized authorities in their fields. These specialists may be called in at any time to work with you on your lubrication problems. More than a thousand research scientists and technicians at our research laboratory support the effort of our representative to serve you. Their mission: To help your American Oil representative help you lower your maintenance costs and stretch your maintenance dollars. Learn more about American Oil, its men, its service, its products.

AMERICAN

AMERICAN OIL COMPANY

910 S. Michigan Ave., Chicago 80, Ill.

Circle 511 on postcard, page 33

How can you cut the cost of electrical repair?

More and more maintenance managers we've talked to are being asked one of two vital questions by their management: "How much can you cut your maintenance budget this year?" or "How much better maintenance will you provide for the same dollars?"

Is there any way out of such a cost squeeze?

Yes! Many managers have cut down on the amount of repair work they do themselves, place this work with outside specialists, spend more time on preventive maintenance.

R. L. Kirkpatrick, Manager, Maintenance Sales, Westinghouse Electric Corporation.

How does this help reduce costs? A good part of the answer lies in what a modern repair plant is and how it operates. First, modern repair plants are experts in building maximum reliability into repaired equipment . . . and they *guarantee* their work. For example, on rewound motors, the guarantee is the same as new motors. Secondly, they are staffed with factory-trained technicians and equipped with the latest and most complete facilities to handle every size and type of electrical equipment.

Often, the repaired equipment, when returned, is better than when new because only the latest materials and techniques have been employed. Specialized test and inspection instruments are used to thoroughly diagnose incoming equipment for engineered repair—and to thoroughly check-out equipment being returned to your production lines.

These expert services are available round-the-clock, seven days a week. Most important, you pay for these services *only when used* and avoid the continuing overhead inherent in an in-plant repair facility.

There is sizeable evidence that consigning repair work to outside experts cuts your repair costs, improves performance reliability, extends the life of the equipment, releases people, dollars, and floor space for production and increased preventive maintenance activities.

Isn't this the way for YOU to cut the cost of electrical repair?

Pittsburgh Coke & Chemical saves thousands annually with Westinghouse Repair service

Other Pittsburgh Coke & Chemical motors, located outdoors, are used to drive chemical and water pumps. These motors operate in an area, near giant 10,000 gallon chemical tanks, that is filled with moisture concentration, and subjected to fumes from caustic coal tar acids.

You can save important repair dollars, like this customer did—

The problem: How to keep 15 motors operationally reliable at Pittsburgh Coke & Chemical Company. These motors, ranging from 3 to 60 hp, of both totally-enclosed-fan-cooled and explosion-proof types, are constantly subjected to high moisture, dust, and corrosive chemical conditions.

Such difficult conditions grounded windings, causing the motors to "burn out," thus cutting off conveyor belt runs, and stopping chemical and water pumps.

One example: A 5-hp Class B insulated motor, located above a quenched coke conveyor belt and in a partially enclosed structure, was under constant contamination attack. Steam condensation caused intense moisture concentration in the confined area, which was also subjected to coke dust. Result? Frequent motor failure, and necessity for rewinding. Costs? The cost of rewinding, the time of men to remove the motor, and the downtime.

The solution: Westinghouse was called in. After analyzing the problem, a solventless epoxy protective encapsulation, Super COILIFE,* was applied to the rewound motor by an exclusive Westinghouse process. This motor operated continuously for 14 months—then stopped only because of a line failure. Other motors are located in the open air, or near pumps and tanks—subject to humidity and caustic coal tar acids, such as phenol. With Super COILIFE encapsulation they now provide uninterrupted service . . . and major yearly savings, reports Pittsburgh Coke and Chemical.

This example is only one of many hundreds illustrating what Westinghouse's comprehensive maintenance service provides . . . for every type of plant, on every kind of electrical or steam equipment. 41 modern plants rebuild, repair, uprate, add new features, and protect such equipment with exclusive insulations such as Thermalastic® and Super COILIFE. Visit your nearby Westinghouse Repair plant and see how modern facilities plus factory-trained technicians can help reduce your costs. Most important,

Pencil points to location where coils are subject to failures caused by dust and chemical deposits. The solventless epoxy, "Super COILIFE," applied at Westinghouse's Repair plant provides complete protection of windings, locking out all foreign matter that might cause them to ground, and the motor to fail.

call in your Westinghouse Representative soon for a review of your repair problems.

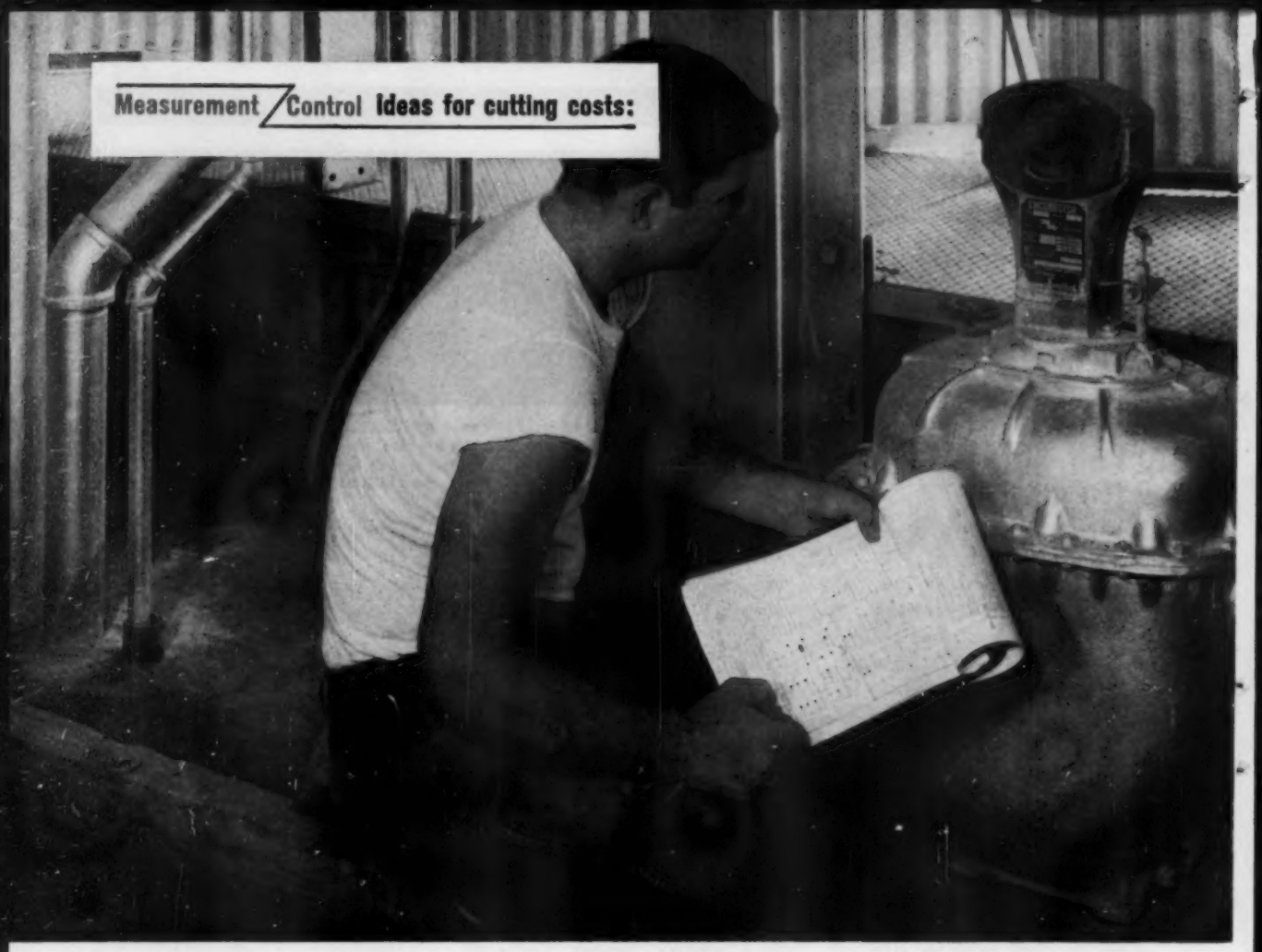
"Maintenance Modernization Means Profits" (B-8223), a new booklet defining the total scope of Westinghouse Maintenance Services, is available on request. Write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

Five-horsepower motor which moves conveyor belt section at Pittsburgh Coke & Chemical Company is examined by chief electrician. In this service, the motor is under the attack of intense steam condensation and extreme coke dust conditions.

You can be sure . . . if it's

Westinghouse

*Trademark
J-95220



Couldn't "in-plant metering" HELP YOU CUT COSTS TOO?

Wherever things flow through pipe in your plant—whether as fuel, aids to production, or finished products—chances are that in-plant metering will be an immediately profitable investment. For example: above, you see Rockwell gas meters installed on individual enameling furnaces. The meters were recommended by a Rockwell field engineer as a fast, easy way of spotting furnace inefficiencies and preventing fuel wastage. Also, accurate fuel cost records of each operation were available for the first time—Cost Accounting Department figures were made more revealing.

In a bottling plant, another Rockwell field engineer recommended water meters to prove amounts of water actually bottled with product. The result: a sizable reduction in a sewage tax based on the premise that all water going into the plant would be discharged into the sewage system.

These are just a few examples of the many ways Rockwell field engineers are helping save time, money and material in a wide variety of manufacturing and process plants. These field men represent Rockwell's experience as the world's largest manufacturer of measurement and control products. Why not have a Rockwell field engineer visit your plant to explore new approaches to cost cutting through improved measurement and control? Send the coupon—there is no obligation.

ROCKWELL

The leading single source for Measurement / Control products and ideas

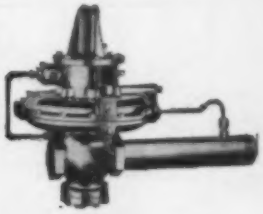
"IN-PLANT" METERING:

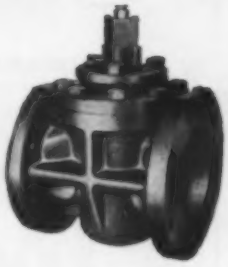
LIQUIDS AND GASES

"IN-PLANT" METERING can mean new cost cutting opportunities. Accurate liquid and gas meters are a positive way of improving cost control, insuring better use of materials, sharpening inventory control, and preventing waste. Whatever the need, Rockwell has the right liquid or gas meter to do the job better and at lower cost.

CONTROLLING PIPED MATERIAL:

LIQUIDS AND GASES





CONTROLLING PIPED MATERIAL more efficiently is a positive step towards cost cutting. Better valves can save wasted products and materials and often increase plant safety. Gas pressure regulators can cut costs by assuring safe, economical use of any gas used in the plant. Rockwell has the world's most complete line of flow control devices.

HOW MUCH COULD YOU SAVE?

There is hardly a plant anywhere—including yours—where the right application of the right measurement and control methods and equipment won't produce savings many times the modest cost involved. Certainly it's worth investigating—especially since it will cost you nothing to find out. Simply mail the coupon now.

SEND COUPON NOW!

MEASUREMENT & CONTROL DEVICES

another fine product by

ROCKWELL

Rockwell Manufacturing Company, Dept. MC2F, Pittsburgh 8, Pa.

Please send me literature as checked:

- ☐ Valving gas, liquids and slurries. Bulletin V-621
- ☐ Measuring gases. Bulletin 1085
- ☐ Regulating gas pressures. Bulletins 1044, 1059, 1082, 1088
- ☐ Measuring liquids. Bulletins P-100, PI-656, OG-400
- ☐ Condensed catalog of all products. Bulletin C-5000
- ☐ Please have your Field Engineer call.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

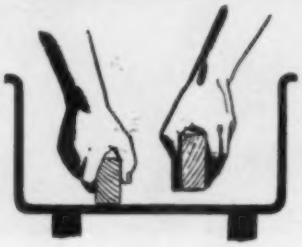
Circle 513 on postcard, page 33

DISTRIBUTOR DAN, the SKF bearing man, says "TO SHRINK A BEARING ONTO A SHAFT GIVE IT A BATH IN HOT OIL"

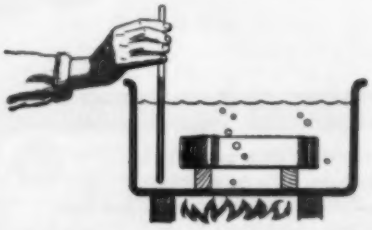
WHY HEAT IT, ANYWAY? If you need an interference fit, it's often convenient to shrink the inner race onto the shaft. To do this, you need to establish a difference in temperature. And it's usually easier to heat and expand the bearing than to cool the shaft.

SOME DO'S AND DON'TS. To heat the bearing, immerse it in hot oil. **Don't** heat the bearing over a flame. And **don't** heat it above 225°F. Plan to use enough oil—either quenching oil that has a minimum flash point of 300°F. or transformer oil.

CLEAN THE CONTAINER FIRST. If you reuse oil, make sure it's absolutely clean by filtering it carefully. Again, use plenty of oil—because too little may heat and cool too rapidly, causing the bearing to heat unevenly.



ANOTHER "HOT" TIP. Place a rack at the bottom of the container and set the bearing on it. This will prevent the bearing from touching the hot bottom. It will also separate the bearing from any contamination that may have settled on the bottom.



TO HEAT BEARING UNIFORMLY, place it in the bath as soon as heating starts. Or else allow sufficient time for entire bearing to reach temperature. Stir oil and heat at 200°F. for 15 minutes. Check temperature by immersing a thermometer near bearing.

PLAY SAFE—BUY ONLY FROM AUTHORIZED SKF DISTRIBUTORS.

SKF

AUTHORIZED DISTRIBUTOR

6039

SKF MOTION ENGINEERING

Advanced ball and roller bearing technology

Circle 514 on postcard, page 33

UNEQUALLED FOR FEATURES AND PERFORMANCE

DRAW-OUT DESIGN LIMITAMP* CONTROL

CONTACTOR IN PLACE

. . . speeds Limitamp control inspection and maintenance

Maintenance is an easy job with General Electric's draw-out Limitamp control. Routine maintenance is quickly performed with the contactor in place.

Coils and contact tips can be changed in minutes. Simply lift out the arc chutes and one arc horn to expose the bolts holding coils and tips in place.

To make your job still easier, a magnet-head wrench is supplied with units. This wrench fits all bolts necessary to change coils and tips. Remember . . . Limitamp control is all front connected.

To replace fuses, you just pull the ejector and the fuses pop up. When a fuse is replaced, it is guided into position by a back-stop on the clip.

Another feature is a special test circuit—built into each control. Bring in external power and connect it to the terminal board. You can then safely operate the panel—automatically isolated from normal power source with the door open—to check out the unit before putting it in service.

Ask your G-E Sales Engineer or Agent about other advanced-design maintenance, installation, operation, and performance features of Limitamp control. Or, write Section 783-25, General Electric Co., Schenectady, N. Y. for Bulletin GEA-6893. Industry Control Dept., Salem, Va.

* Reg. Trade-mark of General Electric Company.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Circle 515 on postcard, page 33

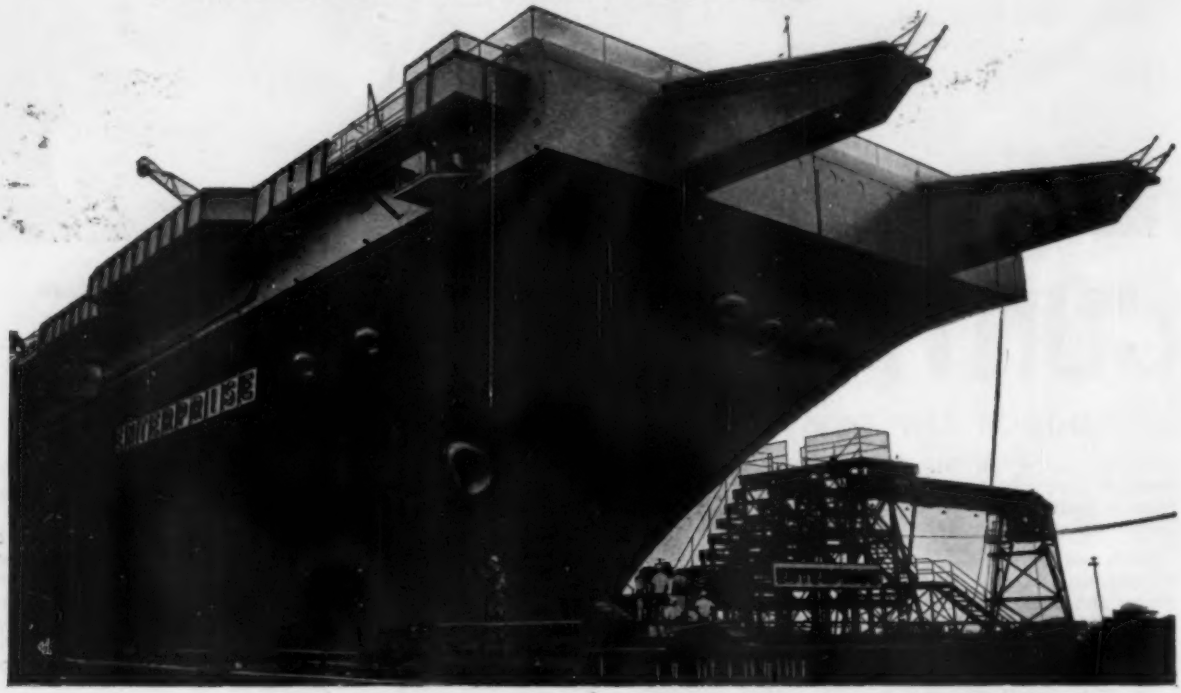
SUPER SAFETY

. . . for super carrier Enterprise.

A. W. Super Diamond floor plate keeps footing sure on first nuclear carrier

Safety underfoot on the U.S.S. Enterprise is assured by A.W. Super Diamond floor plate. Built by Newport News Shipbuilding and Dry Dock Co., the Enterprise is truly a super-ship—the world's first atom-powered aircraft carrier . . . the largest ship afloat . . . with the most powerful nuclear plant on land or sea . . . bringing together the greatest amount of electrical and electronic gear ever assembled in such a compact space. And super-safety matched to this super-ship concept is provided by A.W. Super Diamond underfoot!

Specify A.W. Super Diamond for your flooring jobs—it lasts for years . . . is easy to clean and fabricate. Write for Bulletin SD-S3.



ALAN WOOD STEEL COMPANY

Conshohocken, Pa. • STEEL PRODUCERS WITH THE CUSTOMER IN MIND

DISTRICT OFFICES AND REPRESENTATIVES: Philadelphia • New York • Los Angeles • Boston • Atlanta Cincinnati • Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle Montreal, Toronto and Vancouver, Canada: A. C. Leslie & Co., Ltd.

Circle 516 on postcard, page 33

Better lighted after a coat of aluminum paint made with pigments

from ALCOA

MOBILE ALUMINUM PAINT BRIGHTENS A WAREHOUSE

Here's one view of the Alabama State Dock warehouses after a bright, gleaming coat of Mobile Aluminum Paint, made with ALCOA® Pigments by Mobile Paint Mfg. Co., Inc. Specified for protection against a very humid, semi-tropical atmosphere, Mobile Aluminum was applied to walls, ceiling and structural members. Results: appearance and lighting efficiency were improved.

Time-study men agree: better lighting increases work productivity. Aluminum paint reflects light, brightens any shop or plant. In fact, aluminum-painted surfaces in hard-to-light areas can sometimes *double* the effective illumination from an existing light source.

Economical aluminum has exceptional hiding power. One coat covers old surfaces completely—oil stains, old paint, tars or asphalt don't bleed through. And, with aluminum, you can choose a warm, satiny surface or a gleaming chrome-like finish.

ALCOA does not make paint, but we will be happy to refer you to reputable manufacturers who do. If you would like more information about aluminum paints and roof coatings, please send the coupon.

ALCOA ALUMINUM

PIGMENTS, PASTES & POWDERS

Aluminum Company of America
1751-F Alcoa Building, Pittsburgh 19, Pa.
Please send your free booklets:

- ☐ *Painting With Aluminum*
- ☐ *Aluminum Roof Coatings Make Time Stand Still*

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Circle 517 on postcard, page 33

"THIS LUBRICANT INCREASED BEARING LIFE FROM 2 WEEKS TO 2 YEARS"

—says THE GLOBE COMPANY

"Animal acids and moisture, most harmful to ball and roller bearings prevails in the entire meat packing industry. With conventional lubricants, some of the bearings in our Roto-Cut machines did not last two weeks. Since using Ball Bearing LUBRIPLATE in machines operating continuously 24 hours a day for over two years, we have not had a single bearing replacement."

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

Circle 518 on postcard, page 33

BACKTALK AND FORETHOUGHTS

Pneumatic-Hydraulic Reprints Ready

PLANT ENGINEERING:

"Thank you for the tear sheets of Parts 3, 4, and 5 of your Pneumatic-Hydraulic series. My set is now complete. It is an excellent condensed guide; so excellent, that I have requests for copies.

"Can we purchase three complete sets of all 12 articles, which began with the October, 1959 PLANT ENGINEERING magazine and was completed with the September, 1960 issue. Original copies are so much better than photographic reproductions.

"We want them for our Plant Engineer, Tool Engineer, and Process Development Engineer." *Paul D. Beals, Industrial Engineering, The Hoover Company, North Canton, Ohio.*

PLANT ENGINEERING:

"Will you please send the series of 12 articles on 'How To Design Pneumatic-Hydraulic Actuation Systems.'" *Eugene P. Bonzack, Design Engineer, Radio Corporation of America, Detroit, Michigan.*

■ We have had so many requests for tear sheets of this complete series that we have arranged to have the material reprinted. The 48-page reprint of this series "How To Design Pneumatic-Hydraulic Actuation Systems," is now available at $1.50 per copy. If you would like a copy, send your request to The Editor, PLANT ENGINEERING, 308 East James St., Barrington, Ill.

Maintenance Planning

PLANT ENGINEERING:

"Many thanks for the March issue of PLANT ENGINEERING. As usual there are many articles in it which will assist me with my work, especially the article on 'Maintenance Planning and Scheduling.'

"Would you please send me a reprint of this article? If we can get a central area for our maintenance people we would like to start an arrangement of this kind." *John Gilroy, Director of Plant Engineering, Harnischfeger Corporation, Milwaukee, Wis.*

More Electronic Training

PLANT ENGINEERING:

"We are interested in the electronics training program for maintenance men described in the article on page 122 of your February issue.

"Any further information which you may be able to provide will be greatly appreciated." *Douglas Whillans, Trades Training Coordinator, Spruce Falls Power and Paper Co., Ltd., Kapuskasing, Ontario.*

PLANT ENGINEERING:

"In the February PLANT ENGINEERING magazine I have noted an article on electronic training for maintenance men, mentioning the very fine courses that DeVry Technical Institute can extend to certain individuals to be taken at home in their spare time.

"I would be interested in some elementary courses on basic electricity, basic electronics, and subsequent instrumentation because I feel a knowledge of this relatively new and important field is vitally important.

"Any type of information or textbooks that might be available toward this end would be appreciated." *W. P. Christman, Vice President and Sales Manager, Green Bay Foundry and Machine Works, Green Bay, Wis.*

■ We have forwarded these inquiries to the Institute.

Readers interested in receiving more information regarding the technical courses offered by DeVry Technical Institute, may be able to obtain this at a local level, as DeVry training counselors are located in many cities throughout the country.—*Editors.*

Infrared Control Detects Defects

PLANT ENGINEERING:

"We would appreciate receiving your booklet showing applications of the infrared detector control.

"We are particularly interested in being able to automatically scan knots and defects in lumber and classify separate grain directions and lumber colors. The application would be on an edge patcher that would remove knots and defects and insert a patch to match the adjacent lumber." *John Karich, Mechanical Engineer, Rilco Laminated Products, St. Paul, Minn.*

PLANT ENGINEERING:

"I would appreciate any information regarding infrared detectors as explained in your February, 1961 issue of PLANT ENGINEERING.

"The article was extremely interesting and informative, and we may have several applications for this type device." *J. R. Leicester, Plant Engineering Dept., Bethlehem Steel Company, South San Francisco, Calif.*

PLANT ENGINEERING:

"In your February PLANT ENGINEERING magazine you published an

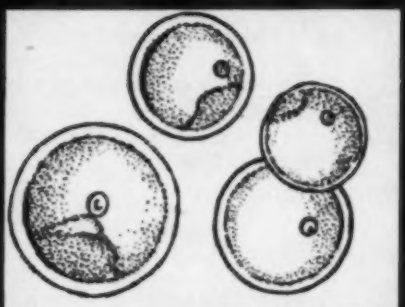
Here's what grows in your cooling towers

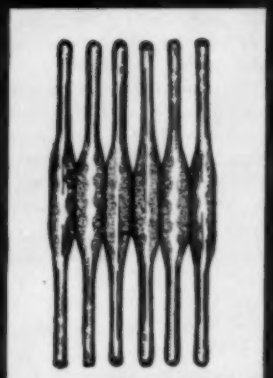
OSCILLATORIA 1000 X*

SCENEDESMUS 1000 X*

MELOSIRA 1000 X*

LEPOCINCLIS 800 X*


CHLOROLLA 2000 X*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*MAGNIFICATIONS AS SHOWN

Dearcide® kills them!

An ideal environment exists in open, recirculating cooling systems for the growth of algae and other microbiological organisms of many types. These often reduce efficiency of cooling towers, heat exchangers, and circulating systems . . . can lead to serious corrosion of cooling system components and deterioration of cooling tower wood. ■ Chlorine in various forms or combinations has, in the past, been a major combative agent in general use in spite of certain objectionable characteristics. ■ Now, Dearcides—products of Dearborn research laboratories—provide more effective control without introducing problems of corrosion, toxicity, and high maintenance costs. Dearcides are non-corrosive . . . will not attack cooling system components . . . have no deleterious effect on wooden cooling towers . . . are compatible with commonly used water treatment chemicals . . . require no feeding equipment. Most have extremely low toxicity to fish and animal life . . . may be used when cooling tower blow-down water is discharged directly into streams or lakes.

MAIL THIS COUPON TODAY

SEND FOR THE REPORT of a two-year study of algae in cooling towers in all parts of the country, made by Dearborn Microbiologist Edward Tehle, Jr. It contains technical information pertinent to your plant wherever it may be located. It's free. It's interesting. It's a valuable reference piece for your water treatment library. Send for it today.

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Circle 519 on postcard, page 33

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RESILIENT SEATED
BUTTERFLY
VALVES

SAVE SPACE
Valve face-to-face is a fraction of the face-to-face of a gate valve. We call it a "wafer" valve.

SAVE WEIGHT
From 60 to 80 percent, depending on size.

SAVE COST
In initial outlay and in overall maintenance.

SAVE TROUBLE
Valve disc shuts off leak-tight against resilient seat from maximum line pressure to high vacuum. The disc cannot jam. Valve is self-cleaning. "Keelok" snap-in type liner is renewable. Control may be manual or automatic.

Write for Bulletin 590X

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2920 Eliot St. • Fairfield, Conn.

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Circle 520 on postcard, page 33

BACKTALK—FORETHOUGHTS

article 'Infrared Detector Controls, Measures and Counts.'

"I would appreciate it if you would, send me additional information regarding this equipment and also names of manufacturers making this type of equipment." *C. H. Leopold, Ferbert-Schorndorfer Co., Cleveland 11, Ohio.*

■ The information requested has been sent to these readers.—*Editors.*

Hurry, Hurry, Hurry!

PLANT ENGINEERING:

"We would like to obtain two copies of the special section 'Industrial Construction and the Plant Engineer' which appeared in the December 1960 issue of PLANT ENGINEERING.

"Our Technical Library maintains a complete file of PLANT ENGINEERING magazines but this particular section was so well received that the Administrative Assistant to our Plant Manager and the Director of our Design Engineering Department feel that an office copy would be of invaluable assistance to them.

"If you are able to supply us with the copies please send them to the attention of the undersigned so that they may be properly cataloged and distributed." *Hettie-Regis Jones, Technical Library, Mason and Hanger-Silas Mason Co., Inc., Amarillo, Texas.*

■ This special section has proved very popular and our supply of reprints is getting low. If you are interested in this helpful information be sure to send in your request soon.—*Editors.*

General Conditions

PLANT ENGINEERING:

"We would like to obtain a copy of your 16-page booklet, "General Conditions for Construction Contracts."

"If there is a mailing charge or fee for the booklet, please ship C.O.D., or notify us of the cost and we will send a money order.

"Your PLANT ENGINEERING magazine is excellent. We have compiled a library of back issues, and refer to them frequently. Thank you for providing such a valuable service in the plant engineering field." *William E. Clow, Engineer, Weiser Company, South Gate, Calif.*

■ A copy of General Conditions has been sent to Mr. Clow with our compliments. All requests should be made on company letterhead. A reprint of the complete set of Construction Specifications is also available for $2.00. The set covers writing the specifications, entering into negotiations with the contractor, analyzing the bids and following up the work done to final inspection and acceptance.—*Editors.*

Electric Trucks

PLANT ENGINEERING:

"Congratulations on a very fine article which appeared in the March issue of PLANT ENGINEERING entitled 'Why Electric Trucks at Crane—In-plant Survey Dictates Choice.'

"We understand this article is to be prepared in three parts, and we would appreciate receiving reprints of each of these articles." *Richard H. Ross, Industrial Truck Div., Clark Equipment Co., Battle Creek, Mich.*

■ We have sent Mr. Ross reprints of Part I. In case any other readers are interested in this part of the article, we still have tear sheets available. By the way, we are planning to reprint the entire three-part article at a later date.—*Editors.*

Collector's Item

PLANT ENGINEERING:

"I am very pleased to see that you have restored 'Construction Briefs' to the April, 1961 issue of PLANT ENGINEERING. This feature is of much general interest and I have collected them for many years.

"PLANT ENGINEERING as a publication is the most informative and best assembled in the field. We make frequent use of your advertisers and reference to the papers. I take this opportunity to thank you for making this available to us." *C. W. Southerington, Chief Engineer, Dallas Div., Revere Copper and Brass, Inc., Chicago, Ill.*

■ Construction Briefs has always been a popular feature with our readers, and reprints are available in booklet form. Booklet No. 1 covers beam reactions, bending moment, moment of inertia and section modulus; No. 2-deflection, horizontal shear and floor loading; No. 3-columns, trusses and welded connections; No. 4-fastening for timber, design of trussed roof and structural design; No. 5-designing in reinforced concrete; and No. 6-design of concrete columns, footings and retaining walls.

Booklets No. 1 through 4 are 50 cents each; Booklets 5 and 6 are 75 cents each; or the complete set of six booklets is available for $3.50. If you would like these booklets, send your request to the Editor, PLANT ENGINEERING, 308 E. James St., Barrington, Ill.—*Editors.*

Circle 521 on postcard, page 33 ➔

installation time cut 52%

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BENJAMIN

SHALLOW-LINE TROFFERS

On job after job Benjamin Shallow-Line troffers have effected tremendous savings in installation costs reducing installation time as much as 52%. Examine the many labor-saving features shown here such as the exclusive swivel-bar mechanism which eliminates cumbersome overhead yokes and the necessity to line-up housings with yokes.

Benjamin has the one line with a complete choice of lamp types and diffusers.
5 basic sizes: 1'x4', 2'x4', 2'x8', 1'x8' and 2'x2'.

1. swivel bar:
Quick adjustment can be made to align troffers in seconds with either hand or power screw driver.

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No screws to tighten . . . no adjustment required. Installs on either side of housing.

3. tab-lock latch:
No tools required for permanent rattle-free fastening.

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SNAP-IN SOCKET plate one-piece assembly snaps in or out without aid of tools.

FUSED FOR SAFETY: cartridge fuses protect equipment against overload.

ONLY 4¼" DEEP for greater structural freedom between floors.

ONE PIECE HOUSING for added strength . . . no sections to fit together eliminates extra labor costs.

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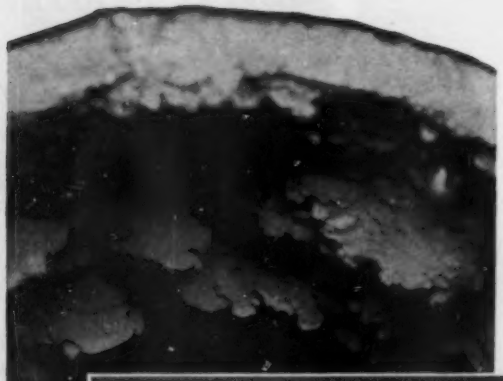
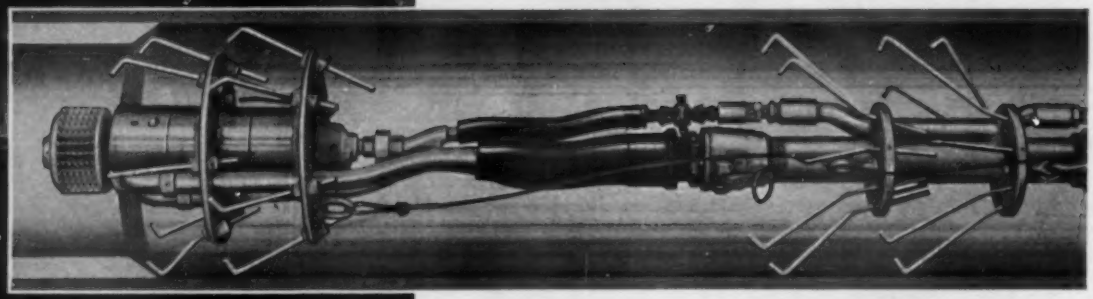


A TOOL FOR STOPPING CORROSION



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Mechanical cleaning and Spunline rehabilitation have saved Douglas Aircraft Company the trouble and expense of replacing 14,000 feet of heavily corroded water pipelines at its El Segundo, California plant.

The Spunline process permanently cures internal corrosion of pipelines. It restores pitted, leaky, inefficient water lines to their original capacity, seals every leak and *stops corrosive action.*

In preparation for Spunline rehabilitation, our expert crews clean pipeline interiors of all corrosion, tubercles and other foreign matter. Then special Spunline equipment applies a continuous lining of dense cement mortar to the pipe interior. The process may be used to rehabilitate cast iron, steel, wrought iron or concrete pipelines from 4 to 180 inches in diameter. All work is done in place without interrupting normal traffic.

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Circle 522 on postcard, page 33

BULLETINS

JUST RELEASED and OF IMMEDIATE PLANT INTEREST

MATERIALS HANDLING

Overhead Handling Ease, Economy

Cranemasters for every building condition, in capacities from 3 to 20 tons, are described in 12-pp Bulletin 6-B. Gives details on cranes' controllers, wheels, heavy-duty hoisting unit. Abell-Howe Co.

For a copy, circle 101 on Post Card

Crane, Monorail Installations

This 12-pp bulletin illustrates typical installations of hand push cranes, motor driven bridge cranes, monorail systems and stacker gantry and special cranes. Jervis B. Webb Co.

For a copy, circle 102 on Post Card

MH Ideas in Motion

Pictured in this 8-pp brochure are new materials-handling methods saving money and effort in a wide range of industrial operations. They feature use of company's lift trucks and suggest solutions to handling problems. Clark Equipment Co.

For a copy, circle 103 on Post Card

Materials Handling Safety Kit

Designed to make operators more efficient and safety conscious, this kit contains lift truck operator's guide, humorous safety cartoons and truck route posters for narrow aisles, blind corners, dangerous crossings, low headroom. Towmotor Corp.

For a copy, circle 104 on Post Card

Handling by Containerization

This bulletin provides a pictorial comparison between handling drummed or bagged material in conventional ways and by use of the Tran-O-Stak to transport and stow flowable materials. Advance Boiler & Tank Co.

For a copy, circle 106 on Post Card

Guide to Bucket Elevators

Catalog 55, an 84-pp manual, simplifies selection and use of bucket elevator systems for handling coal, chips, chemicals, gravel. Illustrates basic types. Tells what to consider in selecting elevator for a given handling problem. Tabulates 101 bulk materials regularly handled and 318 elevator types. Webster Mfg., Inc.

For a copy, circle 107 on Post Card

Casters, Wheels For Industry

Illustrated data on industrial, pneumatic and precision casters, and industrial and pneumatic wheels is presented in 35-pp Catalog CW-61. Specification tables, photos and diagrams included. Saginaw Products Corp.

For a copy, circle 108 on Post Card

Pushbutton Trackside Car Shakeout

Bulletin 172 describes a car shakeout providing automatic operation, even from remote control stations, as well as economical installation and maintenance. Hewitt-Robins.

For a copy, circle 109 on Post Card

For Handling Stacked Sheets

Bulletin 1208B-N shows how company's magnetic sheet floater works and tells advantages in operations involving stacked steel sheets. Dings Magnetic Separator Co.

For a copy, circle 110 on Post Card

STORAGE EQUIPMENT

Storage Racks As Required

Catalog 620, 24 pp, presents a system of rack construction designed to solve storage and materials handling problems. Shows how most racks can be built from few basic fittings. Illustrates general, special purpose racks in use. Unistrut Products Co.

For a copy, circle 111 on Post Card

Controlling Storage Losses

"12 Losses Penco Planning Can Control," 12 pp, pinpoints storage system objectives and tells how to achieve them. Well illustrated, shows how proper steel storage equipment can speed inventory, save space, control theft, speed order filling and shipping, promote safety, reduce costs, excessive handling etc. Penco Div., Alan Wood Steel Co.

For a copy, circle 112 on Post Card

CONSTRUCTION

Pre-engineered Metal Buildings

Six-pp Brochure BD-2602 gives specifications for rigid-frame buildings in clear-span widths from 32 to 120 ft, unlimited lengths. Illustrations show applications and structural and assembly features. Building Div., The Parkersburg Rig and Reel Co.

For a copy, circle 113 on Post Card

Versatile Pole Buildings

Specifications and general design notes on bay-gable pole buildings and illustrations of basic pole structure are included in Bulletin W-391. Koppers Co., Inc.

For a copy, circle 114 on Post Card

Fireproof Roofing, Siding

Asbestone corrugated sheeting, an asbestos-cement roofing and siding, is described in this 39-pp architectural, engineering and data manual. Covers installation techniques, data on loads, strength, hardness and density, supplementary assemblies. Tells how to determine products and accessories required. National Gypsum Co.

For a copy, circle 115 on Post Card

Colored Asbestos-Cement Sheets

Application possibilities and specification details on colorful structural panels are presented in this design folder (Form BM-246). Keasbey & Mattison Co.

For a copy, circle 116 on Post Card

Suspended Acoustical Ceilings

This folder describes Rigid-Grid acoustical ceiling suspension systems, detailing cost-saving features and providing application and specification data. Flangeklamp Corp.

For a copy, circle 117 on Post Card

Glazing for Hazardous Areas

This bulletin describes situations justifying shatter-resistant glazing and characteristics of laminated architectural glass which recommend it as a safety glazing material; also includes typical specifications. Plastics Div., Monsanto Chemical Co.

For a copy, circle 118 on Post Card

Postage-free Reader Service Cards for your convenience in ordering these bulletins are provided on pages 33-34. You may also use the post cards for ordering any literature mentioned in the ads.

Screens As You Like Them

Twenty-pp Bulletin 141 presents Curtainscreen system of components for interior and exterior screens. Covering design and applications, includes scaled architectural sections as well as color illustrations. Shows vision screens, partitions, facing and solar screens, space dividers. Fabrication data included. Julius Blum & Co., Inc.

For a copy, circle 119 on Post Card

Guide to Grating and Treads

Safe load tables, specifying and fastening data and application photos are provided in 24-pp Bulletin 2527R. Types and spacings and bearing bar surfaces of electroforged steel grating and treads are highlighted, also rectangular and U type interlocked aluminum grating. Also describes baked-on epon paint process used. Blaw-Knox Co.

For a copy, circle 120 on Post Card

INSULATION

Insulation of Metal Buildings

Use of Mircolite fiber glass insulation in metal buildings is covered in 6-pp Folder IN-351A. Describes advantages of Microlite in both winter and summer and in year-around sound control. Johns-Manville.

For a copy, circle 121 on Post Card

BULLETINS

(Begins on page 31)

Flexible Foamed Plastic Insulation

Ultra*Foam pipe and sheet insulation for plumbing, heating, air conditioning, and processing is described in this product bulletin, along with data on temperature limitations and efficiencies. Gustin-Bacon Mfg. Co.

For a copy, circle 122 on Post Card

ELECTRICAL

Motor Selection Simplified

Twelve-pp Bulletin B-2515 presents Duty Master a-c motors, 1 to 2000 hp. Outlines their product features. Reliance Electric & Engineering Co.

For a copy, circle 124 on Post Card

Power Center Application Data

Cabinetrol power centers utilizing standard components are described in 16-pp Bulletin GET-3041. Covers squirrel cage, synchronous-motor, wound-rotor-motor and d-c motor combinations, incoming line breakers, secondary breakers and feeder circuit breakers. General Electric Co.

For a copy, circle 125 on Post Card

Standard, Special Torque Motors

Bulletin 208A provides speed-torque curves, duty specifications, dimensions and ratings on torque motors from 1.5 to 96 oz-ft; 116 to 550 v a-c, one- two- and three-phase, and 115 and 230 v d-c. The Ohio Electric Mfg. Co.

For a copy, circle 126 on Post Card

Integral Distribution Centers

Illustrated Bulletin GEA-7222, 24 pp, describes distribution centers with liquid-filled transformers, 112½ kva and above (oil or Pyranol), and dry-type transformers, 300 kva and above. Covers incoming sections, transformer sections, and low voltage equipment. General Electric Co.

For a copy, circle 127 on Post Card

Improved Distribution Transformers

Reduced impendance, higher overload capabilities, simplified construction and other advantages of Endur-All transformers are detailed in 8-pp Bulletin 61B9943. Allis-Chalmers Mfg. Co.

For a copy, circle 128 on Post Card

Lowered Costs with Load Control

Application of load controls (which continuously analyze usage of electrical power by a machine or process) is described in this 32-pp booklet. Explains technique and advantages in short "problem" examples. Machinery Electrification, Inc.

For a copy, circle 129 on Post Card

Metal-Clad Switchgear

Features and details on switchgear rated 2.4 to 13.8 kv are presented in 42-pp Bulletin GEA-5664F. Describes equipment for use with generator and exciter, feeder, incoming line or transformer, induction motor full-voltage starting, synchronous motor neutral reactor. General Electric Co.

For a copy, circle 130 on Post Card

Improved Motion Safety Switch

Safety switch for protecting machines, equipment and processes against damage from stoppage or reduced speed is described and illustrated in Bulletin MS-3. Fuller Co.

For a copy, circle 131 on Post Card

High Voltage Insulated Cable

Bulletin 1131, 48 pp, presents cables insulated with Okonex, a butyl-base high voltage insulation designed for multi-purpose service up to 90 C and resistant to ozone and moisture. Includes data on heavier current carrying capacities afforded, dimensions and designs. The Okonite Co.

For a copy, circle 132 on Post Card

Reel Story on Cables, Cord

Form DC presents industrial reels from 1½-lb size to those capable of retracting a mile of cable, including motor driven types, explosion proof units. Aero Motive Mfg. Co.

For a copy, circle 133 on Post Card

Epoxy Insulation System Selector

Bulletin E-100, covering selected electrical insulating compounds, provides chart giving physical, electrical and system properties. Hysol Corp.

For a copy, circle 134 on Post Card

Insulation Resistance Testing

Twelve-pp Bulletin 21-45 describes Meg type Megger insulation testers in the 500- and 1000-v class with extended sensitivities to 10,000 megohms in the 1000-v instruments. Selection and application in electrical maintenance covered. James G. Biddle Co.

For a copy, circle 135 on Post Card

Grounding Facts, Code Revisions

Recent NEC requirements affecting installation and operation of portable electric tools and equipment are reviewed in this 8-pp booklet. Shows construction of grounding terminals, U-shaped contacts. Includes configuration and voltage chart. The Arrow-Hart & Hegeman Electric Co.

For a copy, circle 136 on Post Card

LIGHTING

Incandescent Lighting Fixtures

Specifications and dimensional data on Endura lighting fixtures featuring flush ceiling treatment, with no exposed screws or hardware, are detailed in 16-pp Catalog Section K. Litecraft Mfg. Corp.

For a copy, circle 137 on Post Card

On Fluorescent Lamp Ballasts

This 16-pp illustrated manual features a section devoted to operation and care of fluorescent ballasts with recommendations for getting proper performance from a lighting installation. Also describes various types of ballasts. Universal Mfg. Corp.

For a copy, circle 138 on Post Card

MECHANICAL POWER TRANSMISSION

Variable Speed Drives

Included in this 112-pp catalog on integral and fractional horsepower drives are selection tables, cutaway drawings and illustrations of modifications, including single, double, and triple reductions, horizontal, single and double worm assemblies. Sterling Electric Motors, Inc.

For a copy, circle 139 on Post Card

Adjustable Speed for Pumping

Rectiflow and Magnaflow adjustable speed drives are discussed in 8-pp Bulletin 5560. Provides drive selector guide for water treatment stations, constant pressure pumping systems, processing. Westinghouse Electric Corp.

For a copy, circle 140 on Post Card

Controlled Speed for Range Drives

Bulletin F-2028, covering application of Varidyne a-c controlled speed systems to range drives, includes schematics on drives for both tension control and tensionless control. U. S. Electrical Motors Inc.

For a copy, circle 141 on Post Card

Couplings for Electric Motors

Folder 2975, 6 pp, describes low cost geared flexible couplings designed for transmitting power to pumps, compressors, generators, speed reducers etc. Link-Belt Co.

For a copy, circle 142 on Post Card

Takeups in Seven Frame Styles

Sixteen-pp Book 2741 describes takeups with sleeve, ball or roller bearings, listing more than 320 different units for adjusting head or foot shafts on conveyors or elevators. Includes data on new multi-bearing frames for direct mounting a variety of pillow blocks. Link-Belt Co.

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PUMPS, COMPRESSORS

High Pressure, Multi-Stage Pumps

Centrifugal pumps in capacities to 2600 gpm, for maximum working pressure to 1200 psi are described in 8-pp Bulletin 722.4. Specifications, performance curves, dimensions included. Goulds Pumps, Inc.

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Low Cost Centrifugal Pumps

Bulletin 3913 describes a double ball bearing end suction centrifugal pump, providing photos, performance tables and dimensions for seven sizes from 1 through 3 in. The Deming Co.

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(More Bulletins on page 201)

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Use this space to ask for tear sheets or other information.

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PLEASE THINK OF THE *NEXT* READER! When removing the first card from this sheet please remove it with care. One of the "pass-along" readers may wish to request bulletins, information, tear sheets or reprints. The redesigned "fire stop" in the perforations makes it easy to remove one card without disturbing the other.

FIRST CLASS
PERMIT No. 11
BARRINGTON, ILL.

BUSINESS REPLY CARD

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY—

Plant Engineering

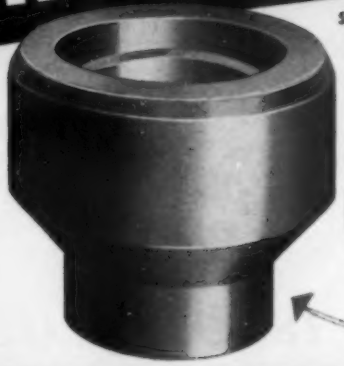
308 EAST JAMES STREET

BARRINGTON, ILLINOIS

Another* Exclusive Vogt Product

FORGED STEEL WELD COUPLETS

THREADED TYPE

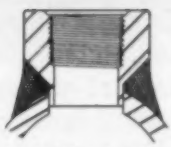


SOCKET WELD TYPE

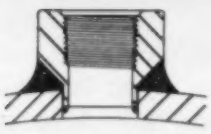
*with Exclusive Vogt "WELD RING"

The Vogt Weld Couplet is an easy-to-install fitting for branch connections from pipe, vessels or tanks. It replaces more-difficult-to-install welding bosses, couplings and the type of fittings requiring trimming or matching to fit contour of vessel or pipe.

Here's How the Exclusive VOGT "WELD RING" Saves Time and Money!



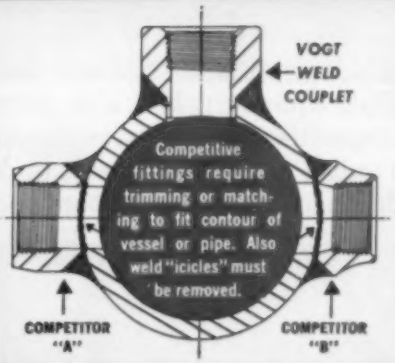
Small Diameter Pipe



Large Diameter Vessel

Vogt Weld Couplets adapt to any pipe or vessel curvature by simply adjusting the height position of the couplet when welding. This characteristic means easy installation, positive positioning and alignment, a stronger weld without distortion, and no inside "icicles" of welding material.

Couplets are available in carbon steel, conforming to A.S.T.M. specifications. Other materials can be supplied on special order.


VOGT
WELD
COUPLET
Competitive fittings require trimming or matching to fit contour of vessel or pipe. Also weld "icicles" must be removed.
COMPETITOR "A"
COMPETITOR "B"

Write for Folder SWC-1 to Dept. 24A-FPLE.

Vogt VALVES, FITTINGS FLANGES & UNIONS

See our complete line in Catalog F-10

HENRY VOGT MACHINE CO., P. O. Box 1918, Louisville 1, Kentucky

SALES OFFICES: Camden, N. J., Charleston, W. Va., Chicago, Cleveland, Dallas, Los Angeles, New York, St. Louis

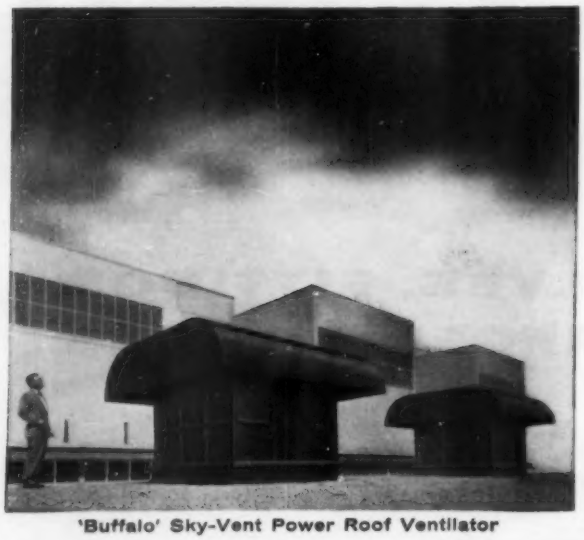
For Direct Long Distance to Louisville dial: 502 ME 4-9411

Circle 523 on postcard, page 33

Clean, controlled and tempered air is widely recognized as a necessity in the operation of a productive plant. Selecting, operating and maintaining this equipment, however, can make a big difference on the cost sheets.

A Plant is Only as Modern as the Air it Breathes!

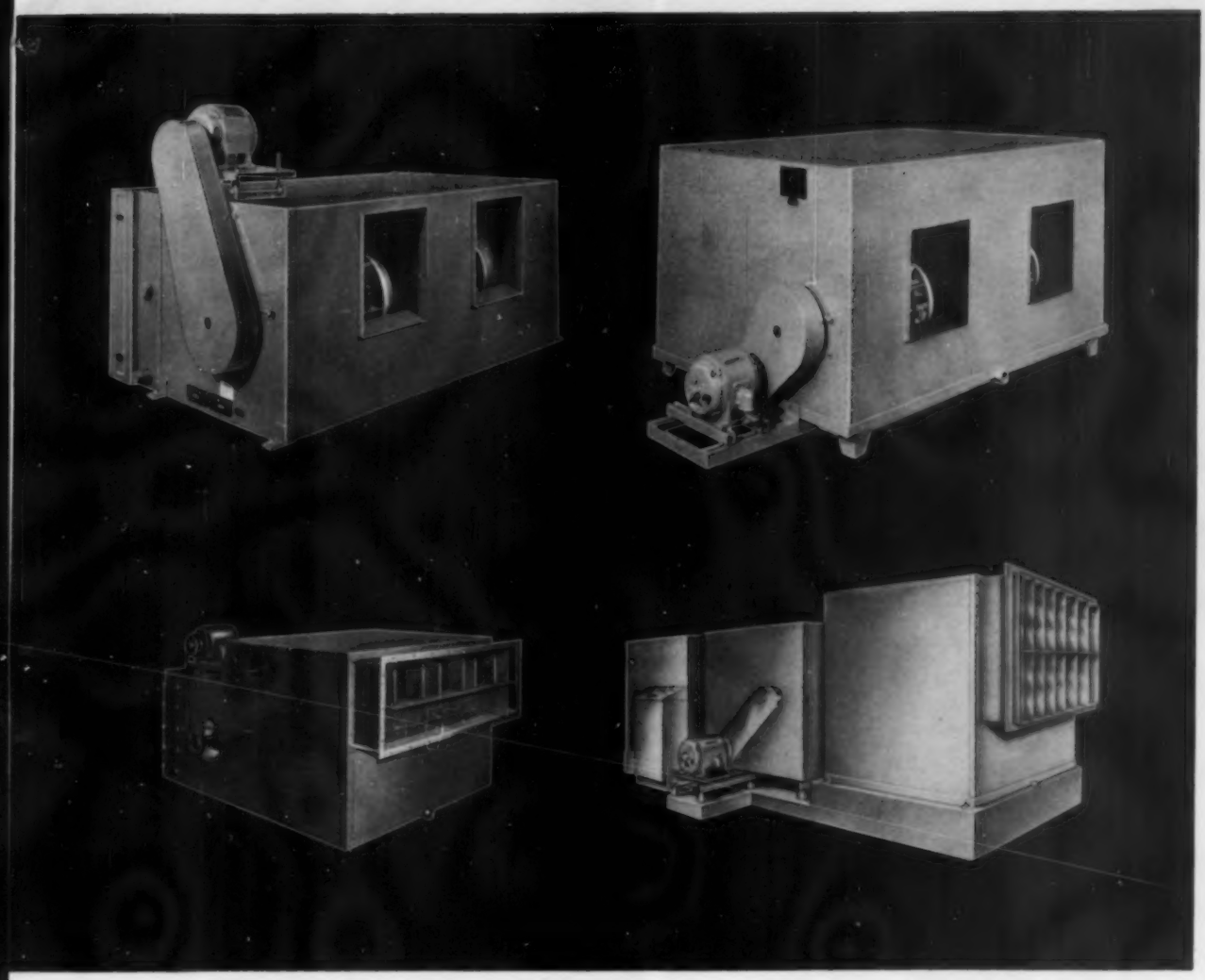
To meet practically every air requirement of today's plant, 'Buffalo' makes a variety of air handling equipment in a wide range of sizes and capacities. The important point is that each unit is designed and built to deliver dependable and effective performance for its specific functions. This can save you plenty of grief as well as money. Equally important, you can take advantage of the specialized knowledge and experience of a nearby 'Buffalo' engineering representative in assuring the best choice of type, size, design and capacity for your requirements.



'Buffalo' Sky-Vent Power Roof Ventilator

ECONOMY PACKAGE VENTILATION

Where you have large, unobstructed areas to ventilate, 'Buffalo' Sky-Vent Roof Ventilators offer big cost advantages. No ducts are required. No floor or wall space is used up. Units are complete "packages," ready to mount in roof curbing. Capacity range from 1000 to 250,000 cfm to handle your largest areas with a minimum number of installations. High fan efficiencies and rugged, heavy-duty 'Buffalo' construction mean lowest possible operating costs. These are fully weatherproof units, capable of withstanding hurricane force winds and corrosive atmospheres. Can also be fitted with filters and coils for make-up air service. Write for Bulletin FM-2345 for details.



PICK THE KIND OF 'BUFFALO' AIR CONDITIONING YOU WANT!

HEATING AND VENTILATING. These efficient packages are versatile — provide you with heat plus fresh air circulation during cold or chilly months, or ventilation only during warm weather. Air is filtered, and may be drawn from outside. Floor or ceiling mounting, vertical or horizontal operation. Check the quality 'Buffalo' construction — write for Bulletin UH-130. *(Top left)*

ZONE CONDITIONING — LOW PRESSURE. Here's quality 'Buffalo' air conditioning that's damper-adjusted to supply different comfort conditions in different areas. Zone openings are individually sized at the factory, too, to provide correct air distribution to each specified area. Sturdy, accessible construction for long life and minimum maintenance. Write for Bulletin AC-220. *(Lower left)*

CENTRAL AIR CONDITIONING for entire buildings — any or all functions from simple summer cooling on up to temperature and humidity control! 'Buffalo' PC Cabinets have proved themselves on many of the largest installations. Reliable conditioning for your building, and far more economical than a number of small units conditioning an equal area. Bulletin AC-121. *(Top right)*

ZONE CONDITIONING — HIGH PRESSURE. These compact units permit minimum-size ducts and grills, and eliminate the need for mechanical refrigeration during marginal weather. Complete factory-fabricated packages with factory-sized dampers, air washing, humidifying, evaporative cooling and standard central station functions. Quality "BL" Fan section isolated by neoprene connection. Write for details. *(Lower right)*

AIR HANDLING DIVISION

BUFFALO FORGE COMPANY

Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

Circle 524 on postcard, page 33

Purchasing Agent, ". . . purchasing fewer types of lubricants in greater volume lowers our costs."

Superintendent, ". . . simplifying anything, including lubrication, pays off in improved efficiency."

GULF MAKES THINGS RUN BETTER

These four men understand the real value of a simplified lubrication program. *Why?* Because a minimum number of lubricants makes their jobs a lot easier.

In some plants, Gulf engineers have found more than *three* times the number of lubes actually needed for efficient operation. This means three times as many ordering, billing, stocking and handling problems. And it also means three times as many chances for human errors.

Examples: One large electrical appliance manufacturer slashed lubricants from dozens to just 6. In addition, a well-known paper company pared lube brands from 39 to 13.

Here's what Gulf engineers can do for you: (1) they can relate their experiences with hundreds of lubricating problems to *your* specific needs, and (2) they can recommend these versatile Gulf® lubricants—Gulf Harmony® Oil, Gulfcrown® Grease

Plant Engineer, ". . . a simplified lube inventory means reduced paperwork, fewer handling and stocking problems."

Oiler, ". . . fewer lubes mean less chance for error, and I get the job done faster."

THROUGH SIMPLIFIED LUBRICATION

and Gulf E.P. Lubricants.

Perhaps there are opportunities in *your* plant for simplified lubrication. A Gulf Sales Engineer is available to help you find them. Contact him at your nearest Gulf office. Or, write today for pamphlets on Gulf multipurpose lubes.

GULF

GULF OIL CORPORATION
Dept. DM, Gulf Building
Houston 2, Texas

Send me booklets on Gulf multipurpose lubricants.

Name_____

Company_____

Title_____

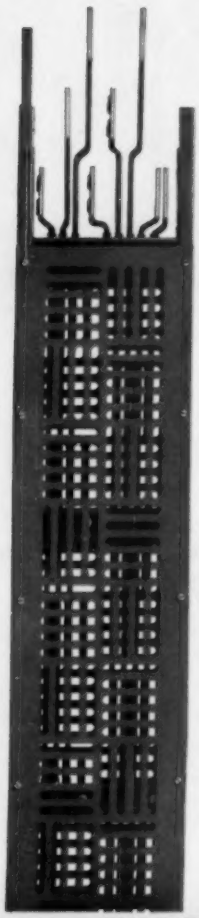
City_____ Zone____ State_____

Circle 525 on postcard, page 33

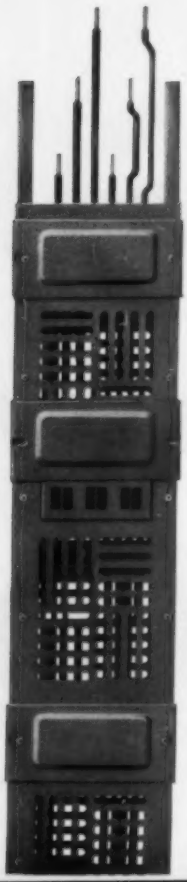
8 types of Westinghouse bus duct— WHY?

PLUG-IN . . . For industrial or commercial applications . . . 225- through 1000-ampere ratings. Plug-in outlets every 12 in. along run. Good for meeting changing requirements in industrial plants.

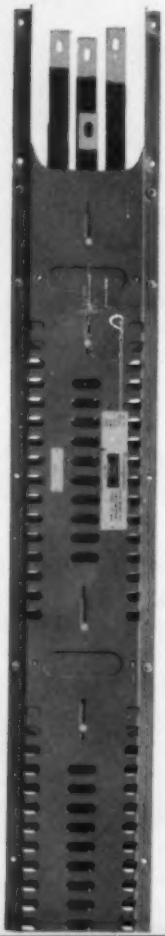
LOW IMPEDANCE . . . Maximum efficiency for long feeder runs . . . 600- through 5000-ampere ratings. Indoor or outdoor applications. A wide variety of special fittings makes this bus duct most flexible to meet special requirements.



PLUG-IN LOW IMPEDANCE . . . Combines the high efficiency of low impedance design plus the convenience of plug-in receptacles. Ratings 600 through 4000 amperes. Accepts standard 3-pole plug-in devices, interchangeable with conventional plug-in duct.



LIFE-LINE . . . A plug-in bus duct with the ultimate in safety features. The plug-in unit can be completely installed and wired before contact is actually made with the bus bars. Ratings 225 through 4000 amps.



Simply because no **one** type will properly meet all duct applications. When the factors of voltage drop, frequency, over-all cost, capacity and plug-in features are weighed, it takes many types to do the job properly. That's why Westinghouse makes 8 specialized types of duct.

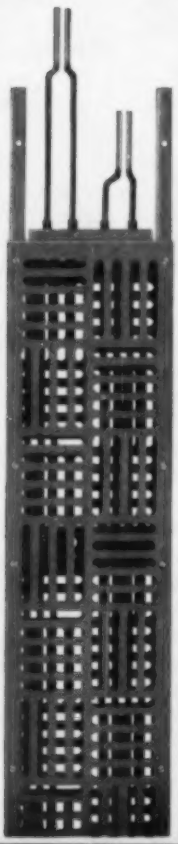
To the consulting engineer, this means the opportunity for optimum design; to the contractor it means fast installation; to the plant engineer it means power savings and low maintenance.

Want complete information on how these 8 types of Westinghouse bus duct can provide a long and useful life for a new building or a new lease on life for an old one? Contact your Westinghouse representative or write: Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa. J-30322

Westinghouse

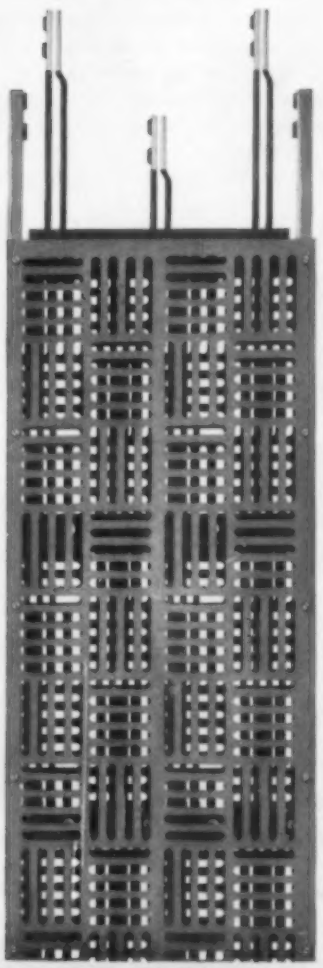
HIGH-FREQUENCY... Most efficient of all power distribution systems for high-frequency application—400 cycles and above. Voltage drop of less than 1 volt per 100 ft at full load. Has plug-in convenience for easy power take-off. Typical applications include aircraft or electronic manufacturing, induction heating and many others.

D-C (Electric Utility) . . . Specially for the distribution of direct current in power plants or factories Available in ratings of 225 to 12,000 amperes. Uses include excitation service for turbine generators, telephone exchanges, battery charging and plating facilities.



100-AMP . . . A new low-capacity, low-cost busway system designed for low current applications with all of the inherent advantages of bus duct. Has plug-in convenience, complete salvability, low installed cost. Fast installation possible because of snap-together joint and completely captivated hardware.

CURRENT LIMITING . . . A bus duct for use feeding from networks, designed specifically to limit the fault current to a value that conventional circuit protective devices can safely interrupt. Ratings 1000 to 4000 amps. Ideal for entrance runs. It also can be used in conjunction with other types of duct.



PLANT ENGINEERS' DIGEST®—so those who rush may read and know what's new

Corrugated-Core Sandwich Panel Process Reduces Costs, Proves Versatile

CALLED ROLL-WELDING, a method of producing corrugated-core sandwich panels has been developed in research sponsored by the Douglas Aircraft Company and announced at Battelle Memorial Institute. This method requires no jigging, provides completely sound core-to-cover bonds, and allows the panels to be extensively formed after assembly.

The process uses hot rolling to pressure-weld the peaks of the corrugated metal core to the cover sheets.

Sandwich panel size is limited only by rolling-mill capacity. One-quarter-inch-thick panels, as large as 36 in. by 72 in. have been produced. Panels have been made of aluminum alloy, steel, molybdenum and other metals.

To form the corrugated core, an accordion-pleated sheet of metal is woven over and under V-shaped inserts of a chemically soluble metal. A rectangular metal frame is placed around the core, and face sheets of the sandwich are added. The entire assembly is clamped in place by two additional metal cover sheets which are welded to the frame. The whole unit is then hot rolled in a direction parallel to the corrugations.

In addition to welding the core to both covers, rolling also reduces the thickness of the panel up to 60 per cent to provide desired shapes.

Core assembly is prepared by inserting metal filled wedges in corrugations.

After rolling, the retaining frame is sawed or sheared off and the metal covers which were welded to the frame are peeled away. With the support wedges still in place, the sandwich panel can now be formed into a wide variety of shapes without buckling the core. Standard tooling can be used, and the panel can be worked as though it were a solid metal plate of equal thickness.

The V-shaped inserts are then leached out of the formed structure with a chemical reagent. Although this process requires several days for very large panels, it is relatively inexpensive, and if necessary the leaching can be accelerated mechanically.

Roll-welded corrugated sandwich panels approach the rigidity of honeycomb sandwiches and are less costly to manufacture. *From Battelle News, published by Battelle Memorial Institute, Columbus, Ohio.*

Rotary Jet Cleans Cars Quickly

TANK CARS, used for shipping a variety of resins and chemicals, must be thoroughly cleaned when returned by a customer, before they can be put back into service.

Rotary jet is used to clean tank cars.

Because time is an important factor in maintaining good customer service, powerful hydraulic jet cleaners are used to speed up cleaning the cars at Rohm and Haas Co., Philadelphia, Pa.

Air operated, the rotary jet cleaning heads use water at 100 psi supplied by a circulating pump. During the cleaning cycle, the tank car is drained of any resin. The cleaning head is then lowered into the car and started, its two nozzles rotating in both vertical and horizontal planes. Supplementing the basic scrubbing action of the powerful jets is the detergent action of an acid or caustic cleaning compound mixed with water. Water is heated to 180 F by exhaust steam from the turbine which powers the circulating pump. Water overflow is screened to remove residue and returned to the mixing pit near the tank cleaning station, saving thousands of gallons of water.

Speed of the cleaning cycle is controlled manually and separately from the pressure of the cleaning fluids used. This permits slowing down the cleaning cycle for tough jobs. For easier cleaning, the unit is simply speeded up by opening the outside air valve.

After the scrubbing, clean water is flushed into the tank using the same rotary jets and as a final check, men enter the car to dry it by hand and to inspect the interior.

This cleaning routine not only provides ready tank cars when needed but actually reduces the number of

(Continued on page 44)

◄ Circle 526 on postcard, page 33

CROUSE/HINDS

WJB and WJBF Series

JUNCTION CONDULETS®

NOW AVAILABLE IN 28 DIFFERENT SIZES...

Heavy-duty junction boxes have to be more than mere splice points. That's why the Crouse-Hinds WJBF floor-Condulet is built to resist wash-down water, atmospheric moisture, dust and alkaline atmospheres — conditions that will reduce an ordinary junction to fireworks long before the Fourth of July. Hot-dip galvanized, cast Feraloy construction does the job.

And you can get the same neoprene-gasketed moisture protection in the surface-mounted raintight Crouse-Hinds WJB Condulet. Both types are available in cast aluminum, sold at the same price as Feraloy.

28 sizes of each type are available, ranging from 4"x4"x4" to 24"x24"x12", with or without mounting feet. The number and size of conduit entrances can be specified or Condulets can be drilled and tapped in the field. *For more information check your Crouse-Hinds Distributor.*

CROUSE HINDS
SYRACUSE NEW YORK

OFFICES: Atlanta Baton Rouge Birmingham Boston Buffalo Charlotte Chicago Cincinnati Cleveland Corpus Christi Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee New Orleans New York Omaha Philadelphia Pittsburgh Portland, Ore. St. Louis St. Paul Salt Lake City San Francisco Seattle Tulsa Washington

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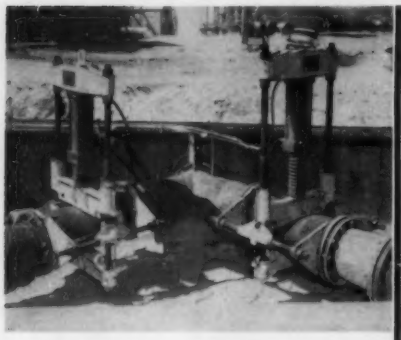
Crouse-Hinds of Canada, Ltd., Toronto, Ont. Crouse-Hinds-Domex, S. A. de C. V. Mexico City, D. F. Peterco, Sao Paulo, Brazil

Circle 527 on postcard, page 33

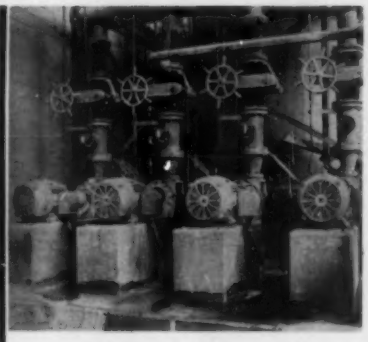
Virginia-Carolina Chemical Corp. Selects Massco-Grigsby Pinch Valves for New Phosphate Plant

200 Valves—sizes from 3" to 10"—types from handwheel to automatic operation.

Based on its previous experience with a large number of Massco-Grigsby Pinch Valves in its plants at Homeland and Clear Springs, the Virginia-Carolina Chemical Corporation purchased approximately 200 M-G valves for its new phosphate plant at Nichols, Florida. These valves were sold and serviced by Mine and Smelter's Sales Agent, R. H. Clark Equipment Co., Inc., Mulberry, Florida.



Two 12" Massco-Grigsby Hydral-Air Pinch Valves on mill tailings line at the Clear Springs Plant of Virginia-Carolina Chemical Corp. Valve system includes solenoids for remote push button control of opening and closing the valves.



Four 6" and four 8" Massco-Grigsby Pinch Valves on the suction and discharge sides of the pumps at Virginia-Carolina Chemical Corporation's new Nichols plant.

Photo courtesy of Westinghouse Electric

Special Advantages of Massco-Grigsby Valves

- Rubber, Neoprene and special compounded rubber sleeves for corrosive and abrasive pulps and liquids.
- Patented "hinged" sleeve. Recesses serve as "hinges" during compression; reduce strain and permit tight closing.
- Unobstructed flow eliminates high friction loss, prevents contamination.

New Automated Systems

The Massco-Grigsby Hydral-60 System consists of one or more pinch valves with a single automatically operated hydraulic pump which may be operated by electric motor or air from normal plant supply system . . . permits controlled circuitry for any operating requirement.

WRITE FOR NEW CATALOG NO. 609

The Company that cares enough to give you the best!

MANUFACTURING DIVISION

MINE AND SMELTER SUPPLY CO.

Denver 16, 3800 Race St. | New York 17, 122 E. 42nd St. | Salt Lake City 1, 121 W. 2nd S. | El Paso, 1515 11th Ave. | Albuquerque, 701 Haines N.W.

LICENSED MANUFACTURERS AND SALES AGENTS in Canada, Australia, Sweden, England, South Africa
Sales Agents in Mexico, Peru, Chile, Philippine Islands, Japan, New York City (for Continental Europe) and in principal cities of the U. S.

Circle 528 on postcard, page 33

PLANT ENGINEERS' DIGEST

(Digest begins on page 42)

cars necessary for shipment of resins. *From a release of Sellers Injector Corp., Philadelphia, Penn.*

Plastic Tanks Preserve Binder

MANUFACTURING various forms of glass fiber mat, Owens-Corning Fiberglas Corp., Aiken, South Carolina, uses a synthetic binder to maintain the glass strand orientation in the finished mat.

In its production this binder is prepared and stored in large quantities. Even though this material is not highly corrosive, the tanks used

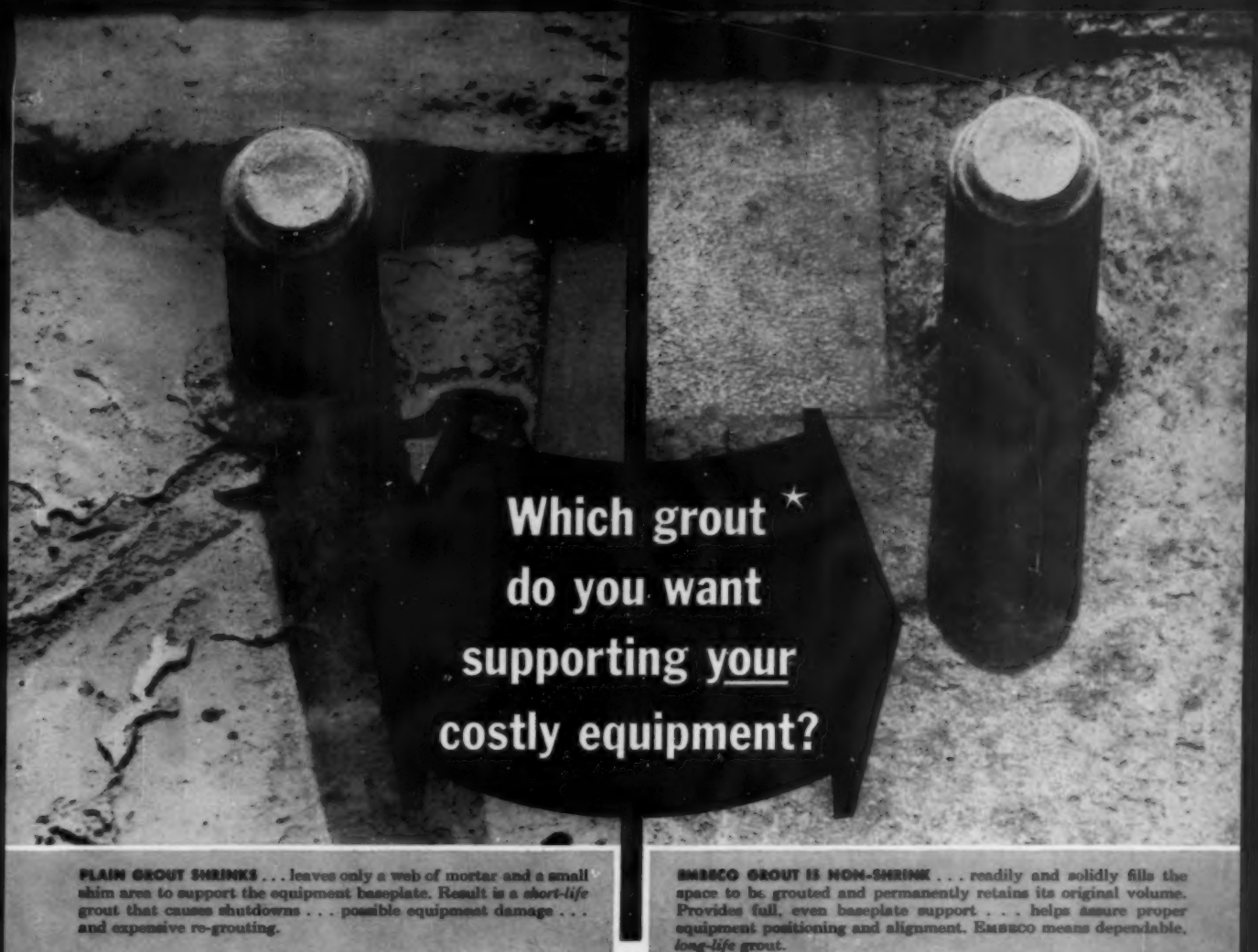
Contents of tanks are checked by looking through the translucent walls.

were found to be unsuitable since minute traces of metallic pickup were experienced from what corrosive activity did occur.

Tanks fabricated from du Verre resin, including the support legs, were chosen because they are inert to the binder solution, require no external painting or maintenance.

The translucent glass-reinforced resin construction poses another advantage since the liquid level can be determined easily by looking through the tank wall. Previously it was necessary to inspect the level by opening a cover and using a dip stick. Since noxious fumes are associated with the tanks, opening the cover

(Continued on page 46)



PLAIN GROUT SHRINKS . . . leaves only a web of mortar and a small shim area to support the equipment baseplate. Result is a *short-life* grout that causes shutdowns . . . possible equipment damage . . . and expensive re-grouting.

EMBECO GROUT IS NON-SHRINK . . . readily and solidly fills the space to be grouted and permanently retains its original volume. Provides full, even baseplate support . . . helps assure proper equipment positioning and alignment. EMBECO means dependable, *long-life* grout.

Today's figures show that *machinery* for the average U. S. factory costs $4,680,000[1] — a sizeable, important investment geared toward smooth, efficient production. But the *grout* under this valuable equipment *costs only pennies* by comparison.

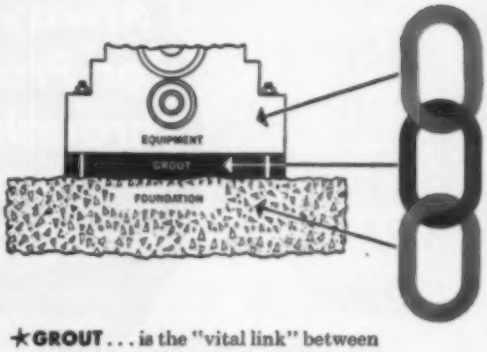
Compare the grouts pictured above. It's clear evidence that EMBECO can save *you* costly re-grouting and production downtime.

Here's why EMBECO means a superior grouting job every time—

- **Non-Shrink** . . . assures tight, level, permanent contact with equipment baseplate.
- **Flowable** . . . quickly, completely fills the space, increases ease of placeability.
- **Strong and Tough** . . . withstands impact, pounding action, vibration, side thrust and torque . . . maintains perfect alignment.

Before *you* grout another piece of heavy equipment—call in the local Master Builders field man for full information, or write to us for details on how EMBECO can help you *grout for good.*

[1]*U.S. average—*initial *machinery and equipment costs for* new *factories.*



★**GROUT** . . . is the "vital link" between equipment and foundation.

The Master Builders Company • Cleveland, Ohio
Division of American-Marietta Company
World-wide manufacturing and service facilities

Our 50th Year

MASTER BUILDERS®
EMBECO*

*EMBECO *is a registered trademark of The Master Builders Co. for its specially-prepared, flowable, non-shrink grouting products.*

Circle 529 on postcard, page 33

HIGH PRESSURE ASBESTOS PACKING
ROTARY & CENTRIFUGAL PUMP PAC
LEATHER METALLIC PACKI
INGS • HYDRAULIC
U V-RINGS • U
T MPRESSOR
BOILER G
L FLAX PAC
B E FRICTION
CO METAL FOIL
PLASTI SHEET PACKIN
CRISS-CROSS RAID • COPPER WIRE
AL • SPIRAL WOUND GASKETS • AIR-C
TEFLON JACKETED GASKETS • PNEUM
HIGH TEMPERATURE STEAM VALVE P
BEL-VEE V-RING PACKINGS • CHEMICA
WOVEN ASBEST T OIL
GASOLINE P CK
CAL SEALS N
AMMONIA S
• JUTE PA
RAMIE PA H
DUCK & RU ON
TEFLON STOCK RODS

If it's Mechanical Packing... BELMONT Has It

Always Available for Prompt Service through Convenient INDUSTRIAL DISTRIBUTORS

See Packing Section, Thomas Register or Conover-Mast Purchasing Directory for Distributor nearest you.

Better Buy BELMONT

THE BELMONT PACKING & RUBBER COMPANY • PHILADELPHIA 37, PA.

Circle 530 on postcard, page 33

PLANT ENGINEERS' DIGEST

(Digest begins on page 42)

enabled them to escape into the room. Now, the operation can be carried out in a closed system, minimizing a personnel hazard. *From a release of du Verre, Inc., Arcade, N. Y.*

Sliding Boxes Protect Parts

PROTECTING EXPENSIVE small parts from shock, dirt and other hazards during storage and assembly is a problem in all plants.

This has been solved by Viking

Thermoplastic boxes easily slide into the adjustable floor-to-ceiling racks.

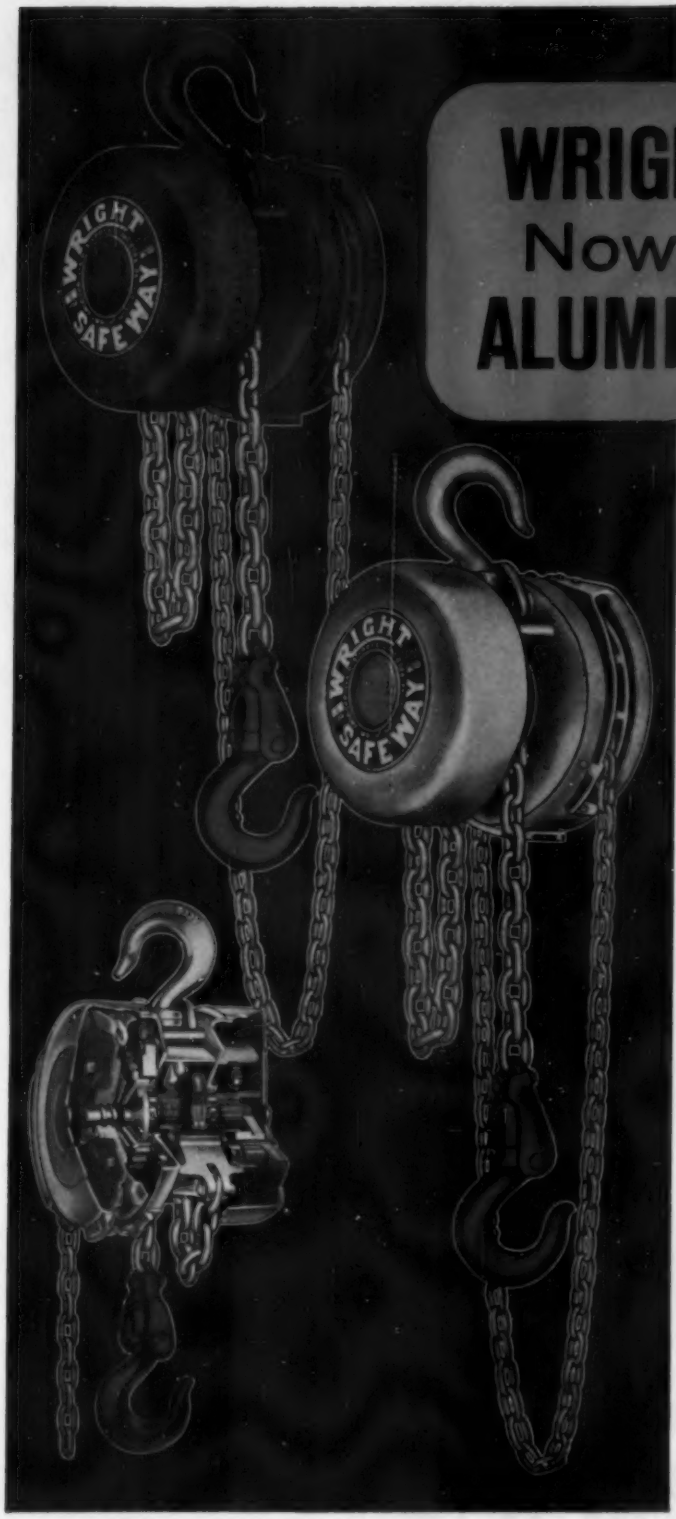
Corp., Newbury Park, California by using flexible Moduboxes.

The boxes, during storage, slide into adjustable floor-to-ceiling racks. No shelves are needed since the lips on the boxes fit cleats on the racks. The boxes fit most standard rack systems or can be adapted to special rack installation. *From a release of Hollywood Plastics, Inc., Los Angeles, Calif.*

Die Lubricant Sprays Away Costs

SINCE THEY began using a dispersed graphite lubricant on all crank forging presses, the Mueller Brass Co., Port Huron, Mich., is saving between $15,000 and $17,000 annually in lubrication time alone.

This savings results from the difference of time necessary to spray the dies, as opposed to swabbing. After being introduced to a sprayable lubricant, Mueller personnel designed



WRIGHT SAFEWAYS
Now Available in
ALUMINUM or STEEL

• Take the finest hand hoist ever made for simplicity of design and sturdiness of construction...add to it new external and internal parts of aluminum...and you have the WRIGHT Aluminum Safeway Hand Hoist. This hoist is made lighter and more easily portable, yet retains all the advantages of the original Safeway design. It features load-bearing parts of strong, shock-resistant steel. Aluminum replaces the heavy steel covers, chain guide and hand chain.

It is a self-lubricating hoist which keeps load chain, load wheel and gear train operating smoothly at all times. Gear train is enclosed in grease-tight chamber and stays lubricated for life. Load chain and load wheel are lubricated by wick-type oiler fed from refillable reservoir.

Two factory tests certify the accuracy, workmanship and rated load-carrying capacities of these new aluminum hoists. Every foot of load chain is proof-tested and every completed hoist is tested at 50% above rated capacity.

Available now in six models in a capacity range of ½ to 4 tons, WRIGHT Aluminum Safeway Hand Hoists offer these outstanding features:

GEAR TRAIN • Planetary system using modified involute stub tooth gear form with all gear teeth generated from solid steel blanks.

LOAD BRAKE • Weston type with uniform composition lining and silent pawl.

LOAD WHEEL • Ferrous alloy, reversible, with accurately formed pockets.

LOAD CHAIN • Electrically welded, has maximum wear resistance and ability to withstand extreme impact.

LOAD CHAIN GUIDE • Guides chain into load wheel and shrouds load sheave, protecting parts from falling dust.

BOTTOM HOOK • Nickel-chrome-molybdenum alloy steel. Rocks and swivels. Operates on a Timken thrust bearing.

Contact Your WRIGHT DISTRIBUTOR

Or write our York, Pa., office for DH-164 and DH-345 which give complete information about WRIGHT Safeway Hand Hoists made from aluminum and steel. Find out the advantages they offer you.

WRIGHT HOISTS

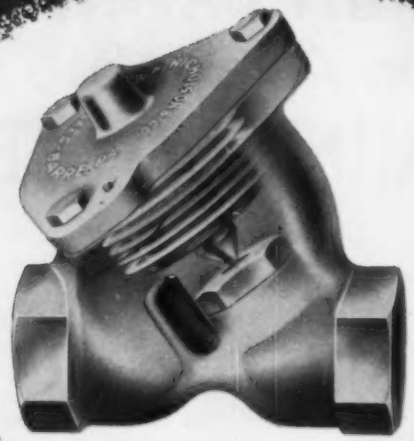
ACCO

Wright Hoist Division • American Chain & Cable Company, Inc.

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Circle 531 on postcard, page 33

A NEW DEVELOPMENT
FOR STEAM-SAVING EFFICIENCY



Nicholson Thermostatic Steam Trap Model N-150

- ALL STEEL CONSTRUCTION
- JUST ONE WORKING PART
- RUGGED MONEL BELLOWS
- NEW BAFFLE* . . . deflects steam upward and away from the orifice to surround the bellows

- FREEZE PROOF WHEN INSTALLED VERTICALLY

- CAN BE TESTED AND INSPECTED WITHOUT BREAKING PIPE CONNECTIONS
- COMPACT, LIGHTWEIGHT, EASY TO INSTALL
- FOR TRACER LINES also Plating Tanks Platen Presses • Unit Heaters • Sterilizers and various types of Cooking and Laundry Equipment. N-150 Traps can also be used as air vents for Receivers, Water Heaters, Mechanical Traps, etc.

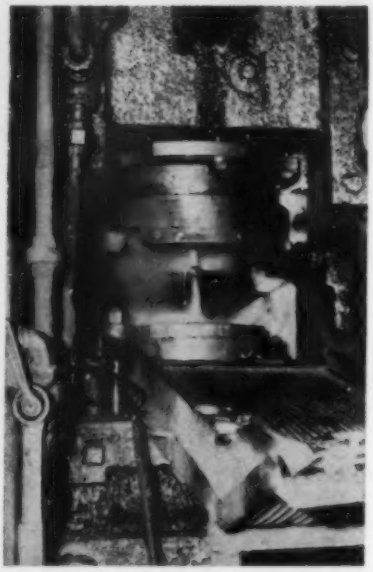
- W. H. NICHOLSON AND CO.
12 Oregon St., Wilkes-Barre, Pa.

* Patent applied for

Circle 532 on postcard, page 33

PLANT ENGINEERS' DIGEST

(Digest begins on page 42)



Special spray apparatus lubricates lower and upper dies simultaneously.

a spray apparatus to lubricate lower and upper dies simultaneously. Prior to this, pressmen swabbed dies between each press stroke. *From a release of Acheson Colloids Co., Port Huron, Mich.*

Bi-Level Storage Speeds Shipments

STORING HEAVY items above and lighter ones below has given Foote Bros. Gear and Machine Corp., Chicago, a fast-moving shipping procedure for its products.

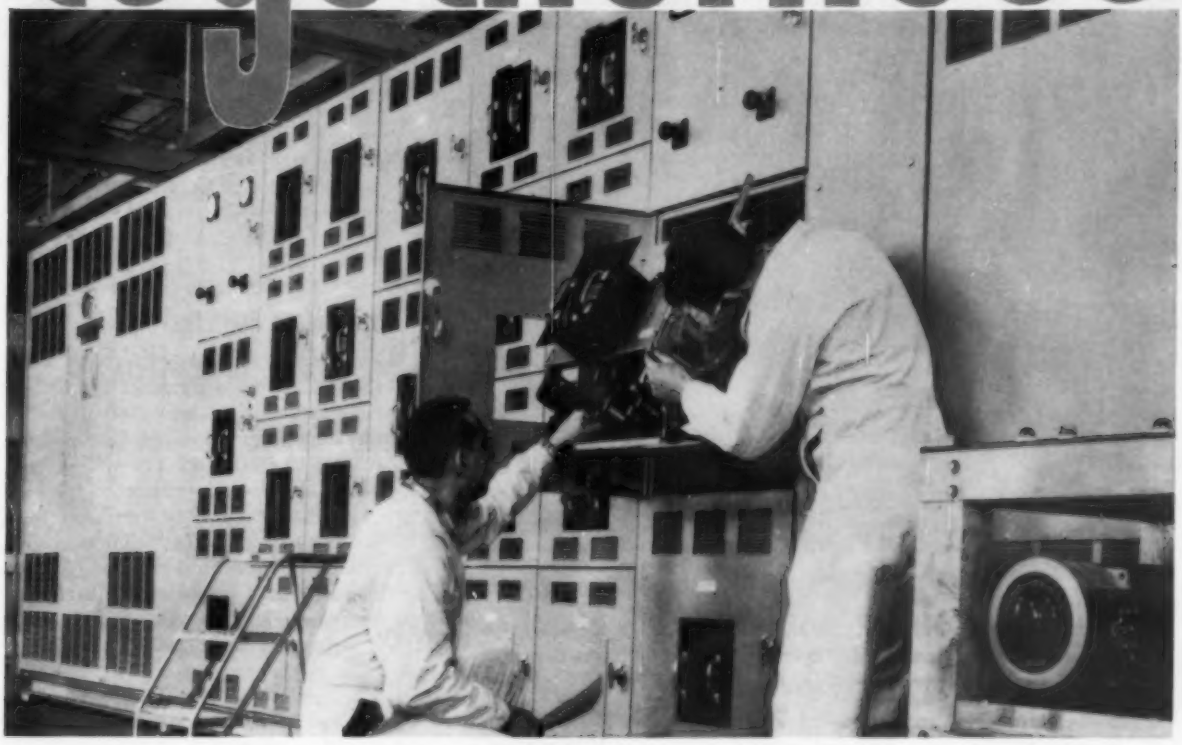
Steel shelves were built from the floor to a height of seven feet, arranged in eight aisles from front to rear. All units that can be handled by one man, without mechanical assistance, are stored in this section. To help stockmen quickly identify orders and to eliminate overhead lighting, portable lights were installed along each row of shelves.

Over the lower shelves, the top section of the storage area was floored with planking to support heavier units. These units are stored uncrated, in tiers and rows according to model numbers. A ceiling tramrail crane system services the entire top-side, handling the heavy units.

This dual system—heavier units on top, handled by tramrail cranes

PENNSYLVANIA
UNIT SUBSTATIONS
A PRODUCT OF

togetherness



*** built together.** Centralized production, scheduling, quality control—these are some of the advantages you gain from Pennsylvania; where substations are engineered together, built together, shipped together.

This kind of togetherness means close association between engineering and manufacturing, so that special requirements are swiftly met, communication accurately directed. It means rigid, uniform quality control of all components at one location. It means coordinated production scheduling within one modern facility where all components of each substation are built together. And it is your assurance of complete, on-time delivery.

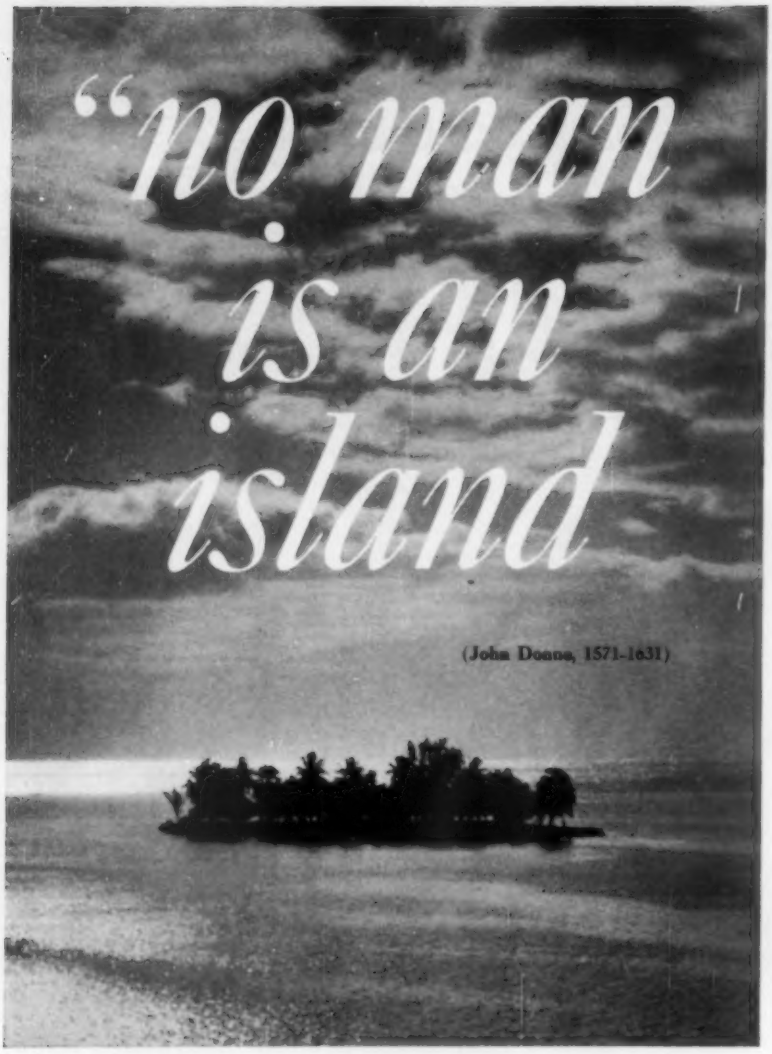
Write for handbook No. PSG-559, which provides extensive engineering and application data on Pennsylvania Secondary Unit Substations. Unit Substation Department, Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

developed
engineered
* built
tested
shipped
serviced

together

pt McGRAW EDISON

Circle 533 on postcard, page 33



entire of itself... Neither can a business organization expect to exist in tranquil isolation, undisturbed by forces that may wash up against it.

Survival in today's sea of competition depends upon anticipating unforeseen factors. Some, such as *fire* and *burglary*, can be controlled. Dependable protection against these ever-present threats is so vital that without it, thriving companies have been staggered overnight by crippling losses.

That is why 70,000 service subscribers, whose properties represent values in excess of 55 billion dollars, help assure the continuity of their business with ADT automatic protection.

Whatever your security requirements, ADT has the widest range of dependable electric protection services to safeguard life, property and profits. Write our Executive Office for descriptive booklet (Canada and U. S. only). Or better still, pick up your phone and call an ADT security specialist. We're listed in your directory.

ADT **AMERICAN DISTRICT TELEGRAPH COMPANY**
Executive Office: 155 Sixth Avenue, New York 13, N. Y.
A NATIONWIDE ORGANIZATION
Circle 534 on postcard, page 33

PLANT ENGINEERS' DIGEST

(Digest begins on page 42)

Placing lighter units on lower shelves, heavy units on upper, speeds handling.

and lighter, "man-size" units on bottom—has cut shipping time by 75 per cent. *From a release of Foote Brothers Gear and Machine Corp., Chicago, Ill.*

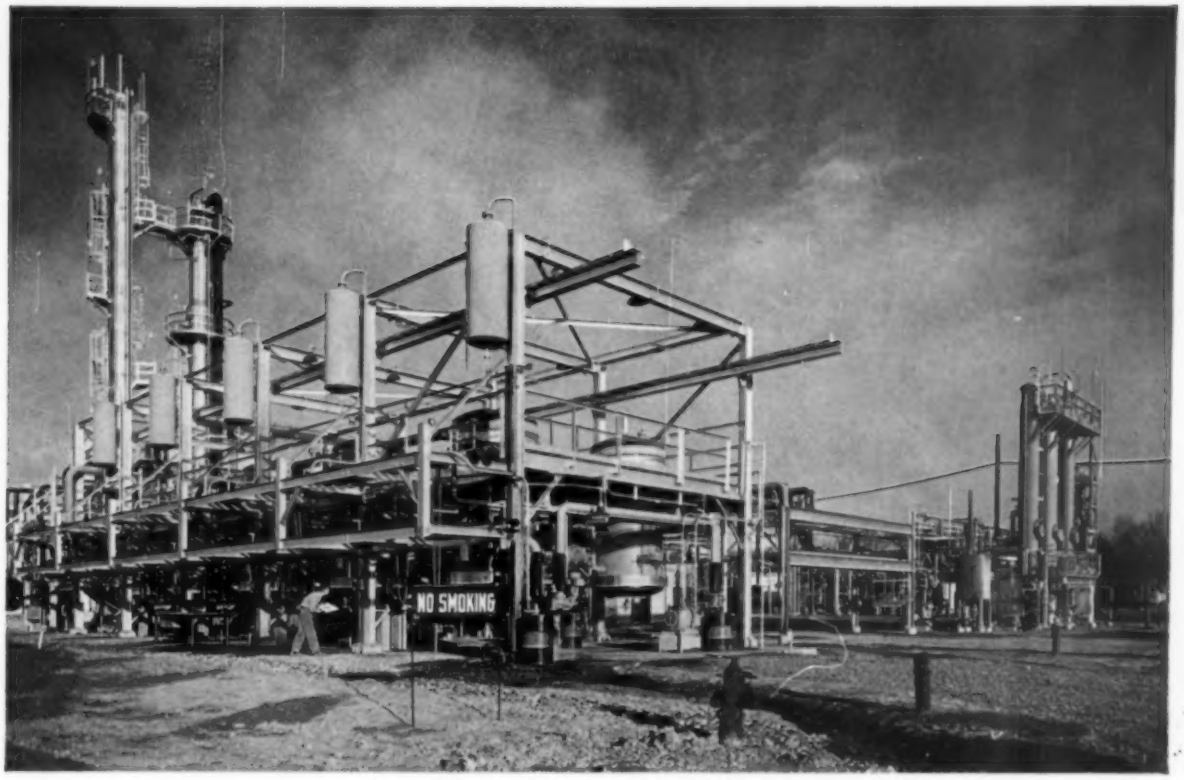
Spray-Made Buildings

EXPERIMENTS SHOW that rigid urethane foam has a big potential in the construction of a wide variety of shelters, especially those structures which have to be erected quickly without regard to aesthetic appearances.

Urethane foam shelters can be made by spraying the foam over an inflated plastic film, allowing the foam to harden, then deflating and removing the film. Doors and windows can be cut out with a saw. The foam's skin can be painted, if desired. Urethane foam huts can be bonded securely to all types of flooring, even to soil.

The light shelters, having a foam density of 2 to 4 lb per cu ft, can be moved from one location to another in one piece or cut into sections which can be put together again by sealing the edges with a mastic. Spray equipment for urethane foam is commercially available.

The urethane shelters provide insulation against heat and cold and are resistant to weather elements, rot and termites. They can be made fire resistant by adding fire retarding agents during the foam formulation. *From a release of National Aniline Division of Allied Chemical and Dye Corporation, New York, N.Y.*



Truscon Specialists Can Help You Save Your Plant, Your Profit, Your Business!

How? Through scientific, dollar-saving protection of every wood, masonry, iron and steel surface inside and outside your plant.

When you call the Truscon man, you get a written specification for proper surface preparation and painting—plus assistance in application and inspection methods.

And this service, even though without obligation to you, is backed by over 50 years of successful experience. Truscon has, in fact, saved millions of dollars annually for plants all over America . . . through scientific protection of floors, walls, roofs, machinery and equipment.

Put this cost-cutting service to work in your plant *now*. Crack down on corrosion, deterioration and disintegration. Call the Truscon man!

FREE!

Mail coupon for Truscon Catalog of Information, a handy booklet for maintenance executives.

TRUSCON Laboratories

DIVISION OF DEVOE & RAYNOLDS COMPANY, INC.

TRUSCON LABORATORIES,
1740 Caniff, Detroit 11, Michigan

☐ Send Truscon Catalog of Information ☐ Send the Truscon man.

Name _____ Title _____

Firm _____

Address _____

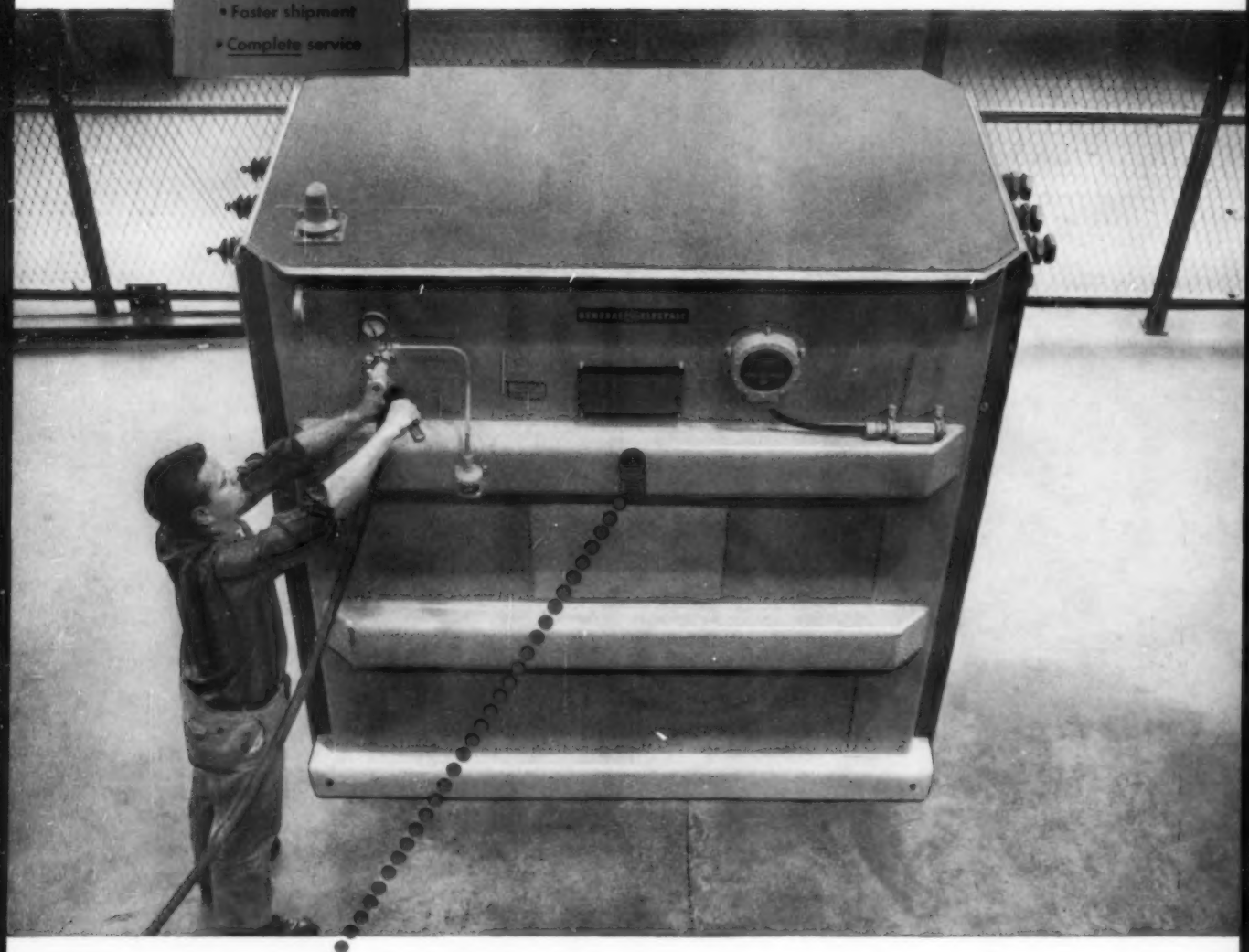
City _____ Zone _____ State _____

Circle 535 on postcard, page 33

FULL-VALUE
CERTIFIED
TRANSFORMER
GENERAL ELECTRIC

- Superior design, features, and performance
- Faster shipment
- Complete service

NEW sealed gas coolant



SYMBOL OF FULL VALUE

With this seal, General Electric certifies full value for your transformer dollar; full value in terms of superior basic design, features, and performance . . . plus faster order handling and shipment . . . plus complete service before, during, and after installation. No other transformer manufacturer can match this complete General Electric package.

dry-type transformers feature for higher insulation levels

General Electric gas-filled units are as much as 30 percent lighter, smaller than previous designs

Use of a new gas—C_3F_8 (Perfluoropropane)—improves heat-transfer characteristics, increases insulation levels, and permits reduction in size and weight of General Electric 15-kv and below sealed dry-type transformers. This new gas has all desirable features of previously used nitrogen . . . plus these added advantages:

- Basic impulse insulation level is significantly higher for all ratings—up to 90 percent above dry-type standards for the 15-kv class.
- Higher insulating properties of C_3F_8 permit size (and, therefore, weight) reduction of sealed dry-type transformers.
- Extremely stable under normal operating conditions, C_3F_8 is non-toxic and non-flammabie.

Plus proved construction features

Alpholite* insulation—Inorganic, non-aging, and non-combustible, this insulation has high mechanical and dielectric strength.

Silicone impregnation of entire core-and-coil structure improves short-circuit strength.

All-welded internal connections give "continuous conductor" construction, eliminate loosening of joints by normal heat cycling.

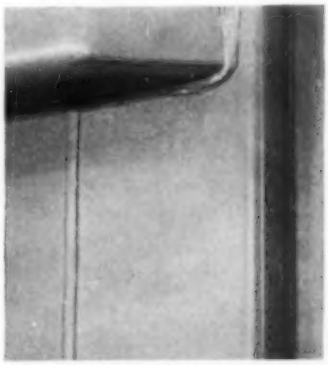
Terretex high-voltage insulation—This refined, inorganic asbestos material is impregnated with acrylic-ester resin and bound with glass wrap.

For more information on superior General Electric gas-filled sealed dry-type transformers, contact your General Electric Sales Engineer or Agent. General Electric Co., Schenectady, N.Y.

*Trade-mark of General Electric Company. 417-11

ACCESSORIES include pressure gage, over-, under-pressure device, and diagrammatic nameplate.

HERMETICALLY SEALED BUSHINGS provide more positive tank seal.



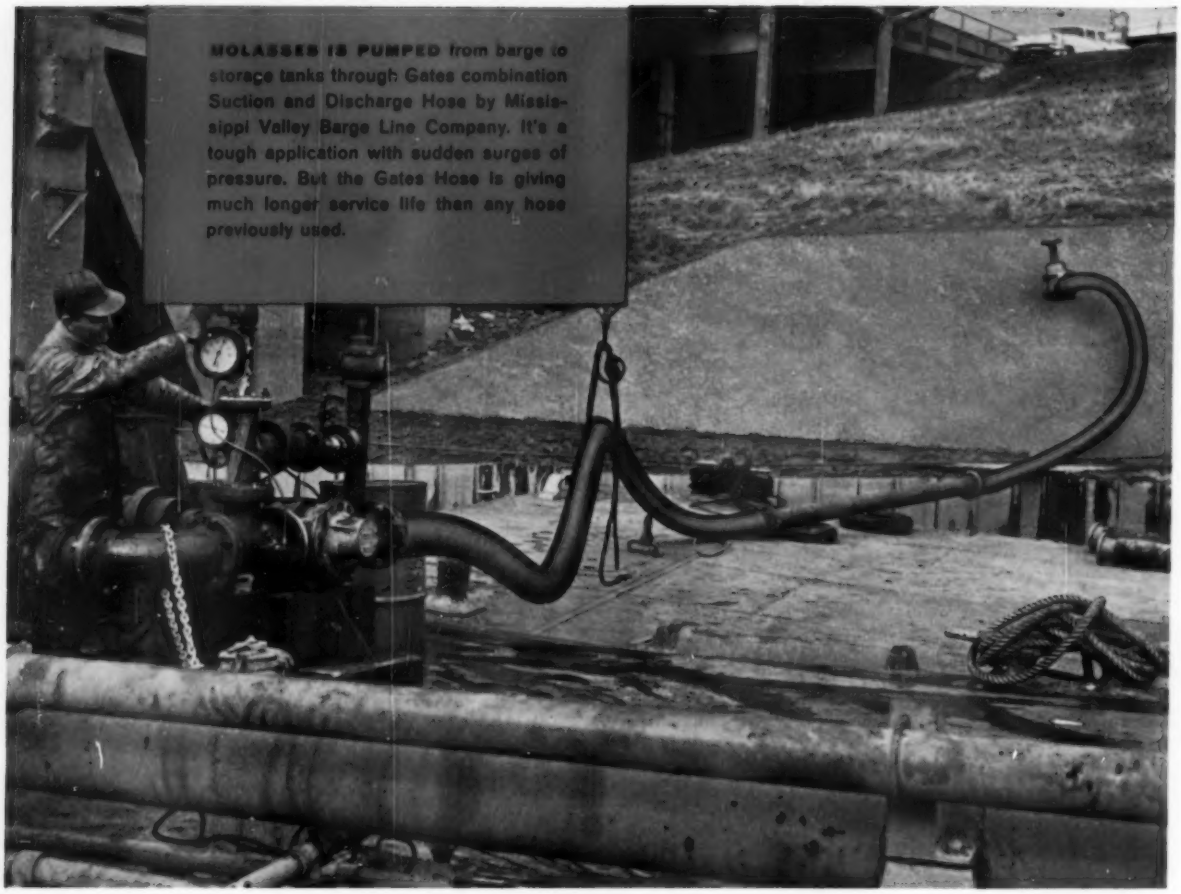
SUBMERGED-ARC WELDING on tank seams, bracing, and flanges provides more uniform welds.

NEW FORMED BASE permits rolling, skidding transformer for installation ease.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Circle 536 on postcard, page 33



MOLASSES IS PUMPED from barge to storage tanks through Gates combination Suction and Discharge Hose by Mississippi Valley Barge Line Company. It's a tough application with sudden surges of pressure. But the Gates Hose is giving much longer service life than any hose previously used.

For molasses or any fluid . . . there's a dependable Gates Hose to convey it!

In any industrial plant, wherever air, water, steam or other fluid must be conveyed, there is a Gates Hose specially built to do the job, and do it exceptionally well. Every Gates Hose is constructed throughout to give you long, trouble-free service, reducing your hose replacement costs.

Gates makes a hose for every application in your plant in a full range of sizes—all are top-quality products of Gates continuing program of *Specialized* Research.

You get fast delivery from local stocks. The hundreds of Gates Distributors, located in all parts of the country and throughout the world, have large stocks of hose on hand, backed by Gates servicing warehouses in every major industrial center.

This means that you always get quick delivery of Gates Industrial Hose from a local source. Call your nearby Gates Distributor when you need hose of any kind for any purpose.

GATES SUCTION AND DISCHARGE HOSE is made sturdy and crush-resistant to withstand rough usage. There are many types and a full range of sizes—for water, acid, oil, gasoline, etc.—a hose for every suction and discharge application.

A Gates Hose for any industrial need is quickly available from your nearby Gates Distributor:

Building the future on 50 years of progress

Gates

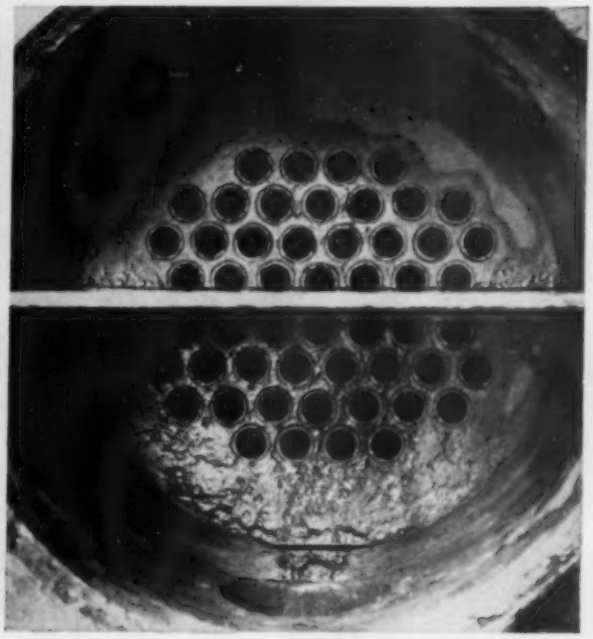
The Gates Rubber Company, Denver, Colorado BP-34

Gates Industrial Hose

Circle 537 on postcard, page 33

Descale equipment quickly, safely, —without dismantling!

BEFORE—This condenser was badly clogged with hard-water scale. Mechanical cleaning of the tubes would have been difficult, time-consuming and costly. To use hydrochloric acid would pose danger to nearby equipment and personnel.



AFTER—It was easily cleaned *without dismantling* by circulating a water solution of a sulfamic acid-based cleaner for an hour. Short downtime, *no* danger to equipment and complete safety for personnel!

Use a dry-acid cleaner based on Du Pont Sulfamic Acid

They're effective. Dry-acid cleaners dissolve most water-side deposits found in condensers, boilers, compressor jackets, heat exchangers, etc. Yet they're much less corrosive to metal than hydrochloric-acid cleaners.

They're easy, safe. Just dissolve the solid cleaner in water and circulate through the equipment. No danger of broken carboys, spilled liquids or toxic fumes—glasses and gloves are the only protective clothing needed!

They're economical, fast. 1 lb. of dry cleaner does the job of 1.3 lb. of 28% hydrochloric acid—you save on shipping, handling, storage and downtime (because there's no dismantling).

Horizontal and vertical condensers, stills, compressors, etc., are readily and economically descaled in place with cleaners based on Du Pont Sulfamic Acid. Plant personnel do the job with a minimum of equipment.

Ask your water-treatment company's technical representative about dry-acid cleaners; chances are, he can supply you. Or send the coupon for booklet and names of formulators offering dry-acid cleaners based on Du Pont Sulfamic Acid.

DU PONT
REG. U.S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.)
Industrial and Biochemicals Department, N-2545PE,
Wilmington 98, Delaware.

Please send your "Descale" booklet and names of formulators offering cleaners based on sulfamic acid.

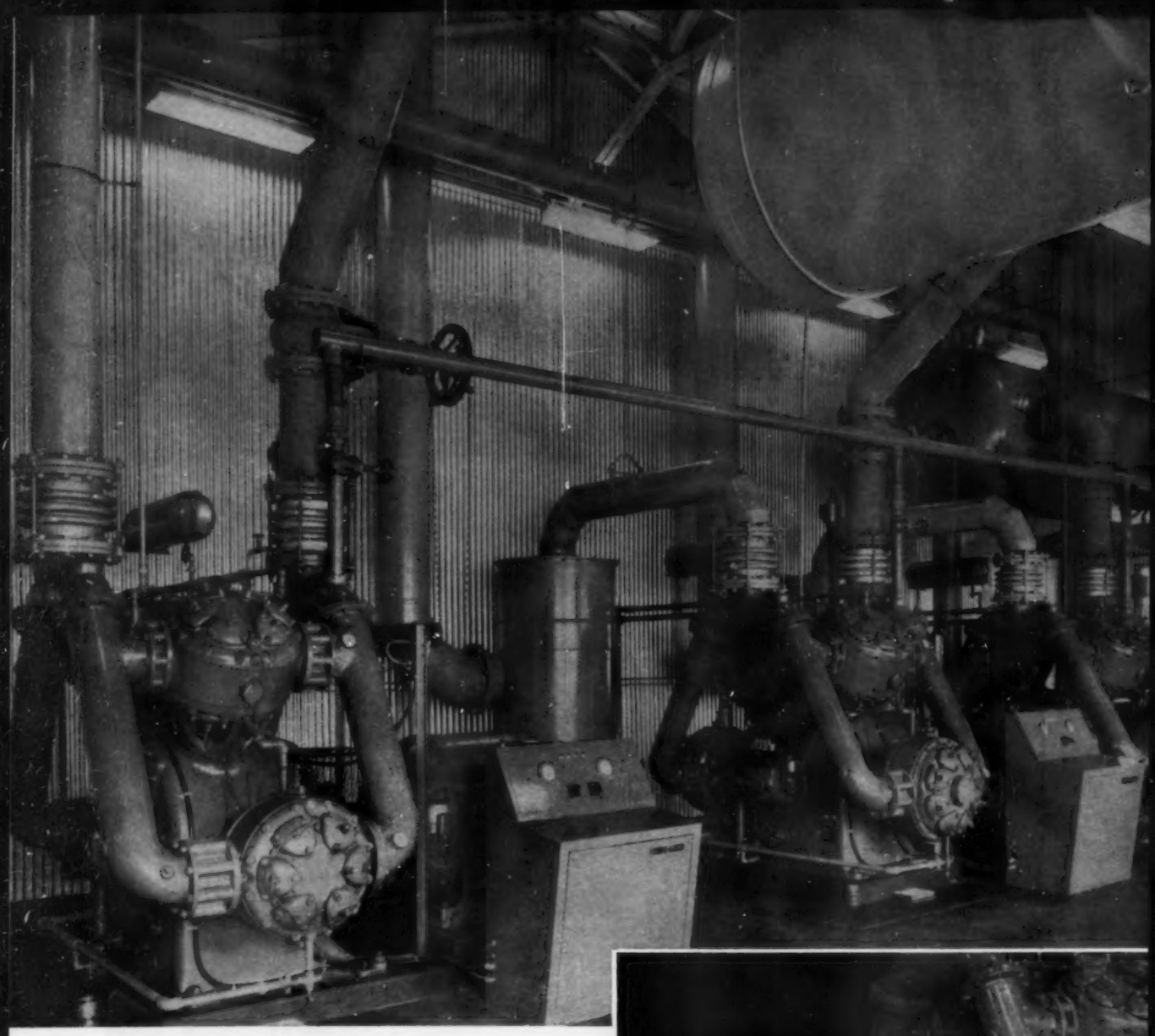
*Name*_____

*Company*_____

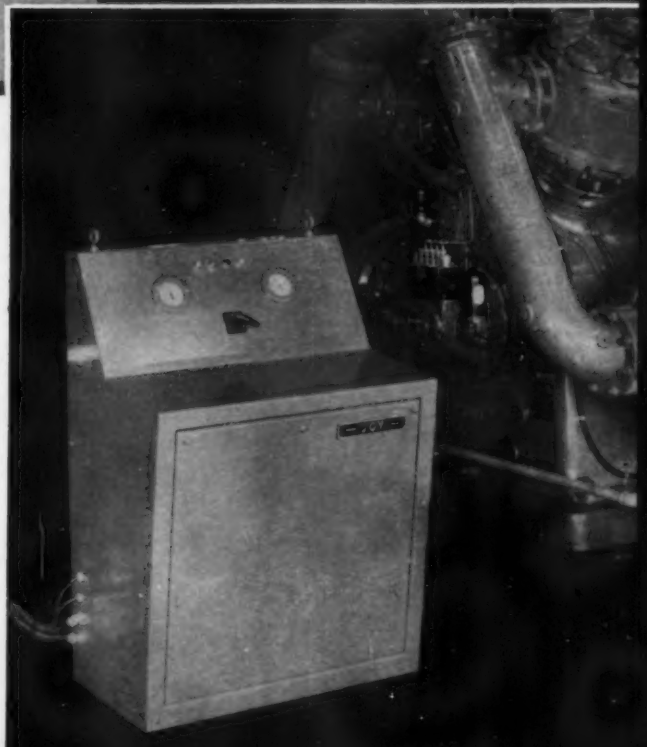
*Address*_____

*City*_____ *State*_____

Circle 538 on postcard, page 33



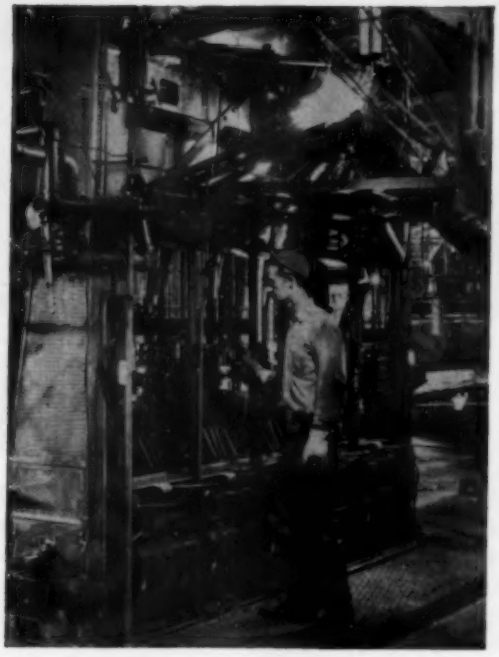
Four Joy WM-114 Compressors supply 4200 cfm of 50 pound air and 5000 cfm of 35 pound air to perform a variety of functions in the Liberty Glass Company's container plant at Sapulpa, Okla.



Completely automatic operation and automatic shutdown protection against malfunctions was provided when this modern compressor room was engineered. Air costs have been cut substantially, and costly shutdowns of the continuous batch glass making process have been completely avoided.

JOY'S completely automatic protection–operation for compressors cuts air cost at Liberty Glass Company

Cost of process air at the big Liberty Glass Company plant at Sapulpa, Okla., has been greatly reduced with the installation of a battery of four Joy WM-114 Compressors. Complete automatic shutdown protection against malfunctions, plus completely automatic operation enables Liberty to run the compressors unattended three shifts per day, seven days per week. Routine maintenance is performed by the plant engineering staff on the daylight shift. Liberty has realized a savings of 15-20% on the direct cost of maintenance since installing the Joy machines, and has completely avoided costly shutdowns of the continuous process.



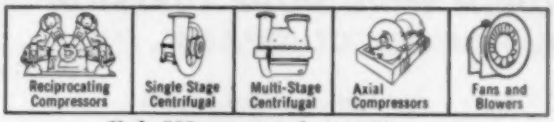
Automatic shutdown protection is provided against lubrication failure, high discharge air pressure, high cooling water temperature and low cooling water pressure. In addition, the motor-generator set, water circulating pump and cooling fan on the air-cooled heat exchanger for jacket cooling water are electrically interlocked and will shut off in the event of an electrical failure anywhere in the system.

All four compressors have five-step control. Two are set for 50 pound air, the other two for 35 pound. In each pair, either machine can be automatically set to carry the base load, and all cylinders on each machine can be individually set to run unloaded when demand is low. The two 50 pound machines can also be cut into the 35 pound header through a throttle valve to meet very high demand for 35 pound air. This gives Liberty complete flexibility in meeting the air demand.

For complete information on how Joy compressors can cut your air costs, consult your Joy representative, or write for Bulletin 3186-15.

The big, modern Liberty plant turns out 3300 gross of plain and decorated returnable glass milk, beverage and general line containers per day. Founded in 1912, it is one of the oldest and biggest container companies west of the Mississippi.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY



JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

Circle 539 on postcard, page 33

to stay
in the black...
Specify
Leschen

RED-STRAND!

Black . . . the most attractive color in bookkeeping. There's no magic formula for staying in the black, but careful consideration of the right type and make of wire rope can cut costs substantially—10%, 20% or more.

RED-STRAND users are accustomed to longer-than-expected wire rope service, because higher-than-catalog-rated quality is built into the rope. They know that Leschen distributors and field men make sure they have the best rope construction for the job at hand. They know, and you can too, that for wire rope and sling needs—specify RED-STRAND and stay in the black! For the name of your nearest Leschen distributor write: Leschen Wire Rope Division, H. K. Porter Company, Inc. 2727 Hamilton Avenue, St. Louis 12, Mo.

PORTER

LESCHEN WIRE ROPE DIVISION
H. K. PORTER COMPANY, INC.

Circle 540 on postcard, page 33

BIG SAVINGS with STACKER CRANES

Save Space... Save Time... Save Handling Costs

You make savings in various ways with a Cleveland Tramrail Stacker Crane. You increase the storage capacity of a room because you make greater use of its cubic measurement, i.e., materials are stored to greater heights and aisleway widths reduced.

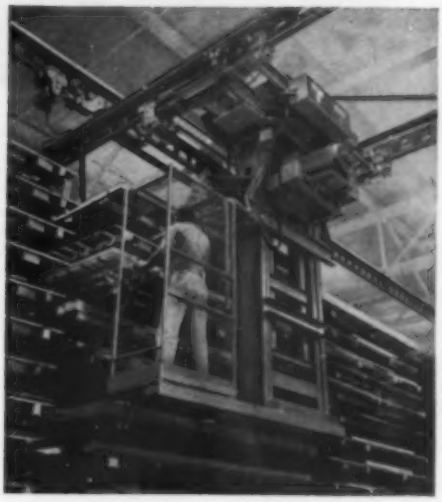
You save time because heavy, awkward loads are picked up, moved and set in place in one fast operation. No time is lost fastening chains, ropes or slings in place, or clamping a grab into position.

You speed handling because a Cleveland Tramrail Stacker Crane will deliver materials from a truck, gondola railroad car or any location on the floor to storage or other areas, directly, with no in-between handling.

You save man-hours because the stacker permits one man alone, operating controls in the cab, to take care of the entire materials handling job without need of floor assistants.

Various designs of Cleveland Tramrail stackers are available to suit practically any situation.

One of several types of Cleveland Tramrail stackers. This unit has a lift of 15'-6", turns 360° clockwise or counterclockwise and handles loads to 3 tons. The mast telescopes and when fork is in high position, the clearance underneath to floor is nearly 8 feet.



Materials are easily lifted on and off racks. All controls are in the stacker cab which also travels up and down to always provide the operator with a close-up view of the load. This equipment permits fast, easy materials selection. Operator can maintain inventory record in stacker cab.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 7559 E. 290 ST. • WICKLIFFE, OHIO

Circle 541 on postcard, page 33

ALL YOU NEED IS A WRENCH

AND A MAN TO USE IT!

Dresser® Couplings and fittings are the quickest, simplest, easiest and most economical way to make strong, permanent pipe connections. They are designed for long life under adverse conditions. They are designed to "live" in the ground...on the ground...above the ground—resisting corrosion and providing joints that best take earth shifts or the

vibrations of heavy machinery. New installations as well as repairs to existing lines are performed quickly, simply and inexpensively. The only tool required is a wrench, and any workman can install Dresser Couplings and Fittings with a minimum of instruction and supervision. Your nearby Dresser Distributor has everything you need. Call him today or send for Dresser's illustrated Complete Line Catalog. You can always specify Dresser—with confidence.

dmd
DRESSER
MANUFACTURING DIVISION
BRADFORD, PENNSYLVANIA

DRESSER INDUSTRIES, INC.

OIL ▪ GAS
CHEMICAL
ELECTRONIC
INDUSTRIAL

STYLE 38 COUPLING
For joining and repairing plain end steel or cast iron pipe. Sizes ⅜" through 72" and larger.

STYLE 65, 90 AND 88 COMPRESSION FITTINGS
To join small diameter pipe and copper tubing, protect valuable machinery and equipment from vibration damage. Sizes ⅜" through 2".

STYLE 98 "KUPL+LOK"T.M.
Fittings and couplings for grooved end pipe. Combines pipe joining dependability with positive lock. For working pressures 500 psi and 1,000 psi. Sizes 2" through 8".

STYLE 63 EXPANSION JOINTS
Absorb concentrated expansion and contraction of exposed pipelines. Built to order. All sizes.

STYLE 4 AND 41 COLLAR CLAMPS
Seal leaks through threads without shutting down line. Ideal for repair of threaded couplings on process and other piping. Sizes ¾" through 12".

STYLE 118 "HANDIBAND"® REPAIR CLAMP
Repairs holes in steel pipes quickly. Resists corrosion and right for most line contents including oils. Sizes ½" through 8"; and 3", 6", 9", 12" lengths.

"360"® REPAIR CLAMP
Repairs holes and breaks in asbestos-cement, cast iron pipe with "all-around" pack. Sizes 2" through 14" in various lengths to 30".

STYLE 60 BELL-JOINT CLAMP
To repair leaks in cast iron bell-and-spigot joints. Also available in Style 60-S for leaks through CIP stab-joints. Sizes 3" through 60".

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OPERATION AND PRODUCTION—pointers for the industrial plant engineer

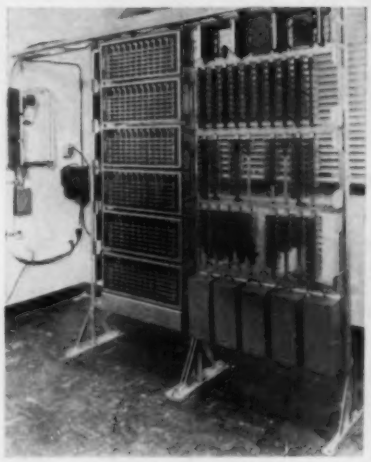
Edited by Vern Kempf

Intercom System Dials 200 Stations—Provides Hands-Free, Two-Way Communications

To EFFECT a reduction in internal telephone traffic, Joseph T. Ryerson & Son, Inc. of Chicago has recently installed a new intercommunication system to provide hands-free, two-way communication between any of 200 stations located throughout the office. Conventional intercom, in order to provide such flexibility, would require miles of cable and large call boxes.

In contrast, the Ring-Master system installed uses a central automatic switchboard so that desk-top call units can be made slightly smaller than a conventional telephone. Each call station is cabled directly into the central switchboard rather than being cabled to other stations in the system. This feature permits each station to call any of the 200 stations in the network.

Pushbutton dialing makes call selection fast and efficient. Voice reproduction is excellent and normal conversations can be carried on within five feet of the unit.



All intercom stations are cabled directly to this automatic switchboard.

Desk unit has 12 pushbuttons for dialing any of the stations in the system.

Since its installation by Scan-Am Company of McHenry, Illinois, the system has significantly reduced the number of internal telephone calls, leaving lines free for customer calls. Call stations located at strategic points throughout the office provided immediate means of securing information necessary for filling customer orders.

Soft Starts Ease Motor Load

STARTING the heavy inertia load of a paper pulp beater was a serious problem at the Hawley Products Company, St. Charles, Illinois. Whenever attempts were made to start the machine across-the-line, motor heaters would kick out or flat belts would slip unless the motor starter switch was jogged to bring the machine gradually up to speed.

Equipping paper pulp beaters with dry fluid drives solved starting problems.

Efficiency of 10 such machines has been increased greatly since the company started installing Flexidyne dry fluid drives in April, 1959. According to Russell Curtis, plant engineer, there has been no maintenance of any kind since the new drives were installed and the beaters are now brought up to speed without belt slippage or undue strain on the motors.

Employing a mechanical principle to achieve soft starts, the dry fluid drive also provides overload protection for motors. Engagement is by means of hardened steel shot, a measured amount of which is contained in the coupling's housing which is keyed to the motor shaft. As the motor starts, centrifugal force throws the steel shot to the periphery of the housing. Here it packs between the housing and a crimped rotor blade which transmits power to the load. Slippage at start is followed by gradual engagement, so that 100 per cent efficiency is achieved at full load speed.

Developed by Dodge Manufacturing Company, Flexidyne permits smaller motors to be used for heavy inertia loads and slips under overload at a predetermined torque level.

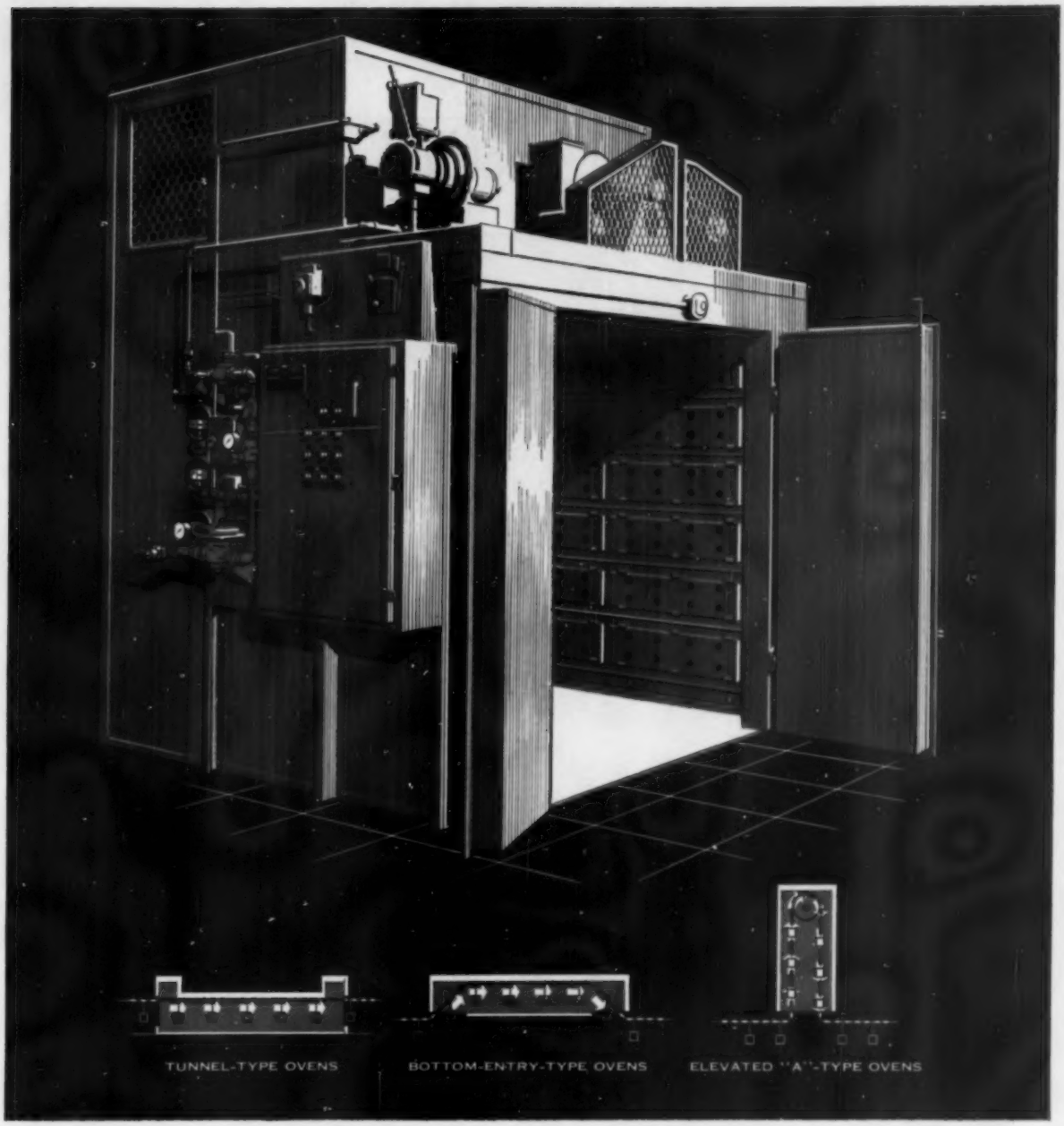
Grit Provides Safe Footing

MOISTURE on a pedestrian ramp inside the main entrance to the Brockway Glass Company, Lapel, Indiana, caused slippery walking conditions for some 250 employees using the ramp each day. Immediate action was necessary to avert accidents.

Maintenance superintendent Earl McNeil conducted a search for a surface coating that would resist the wear of heavy foot-traffic and nullify the slipping hazard. The danger was temporarily averted when several non-slip materials were applied to the ramp surface. Although some reduced the slipping dangers, all proved ineffective to wear.

The coating that proved most dur-

(Continued on page 64)



Batch-type ovens from DeVilbiss are your answer when you need fast, uniform baking, drying, dehydrating, preheating, or curing. They come knocked down or assembled in a choice of sizes, capacities, and heating media—to give you a "custom" oven at a standard price. DeVilbiss' engineering and experience assure the best oven—packaged or specially designed—for you.

Talk to DeVilbiss about all your industrial baking and drying needs

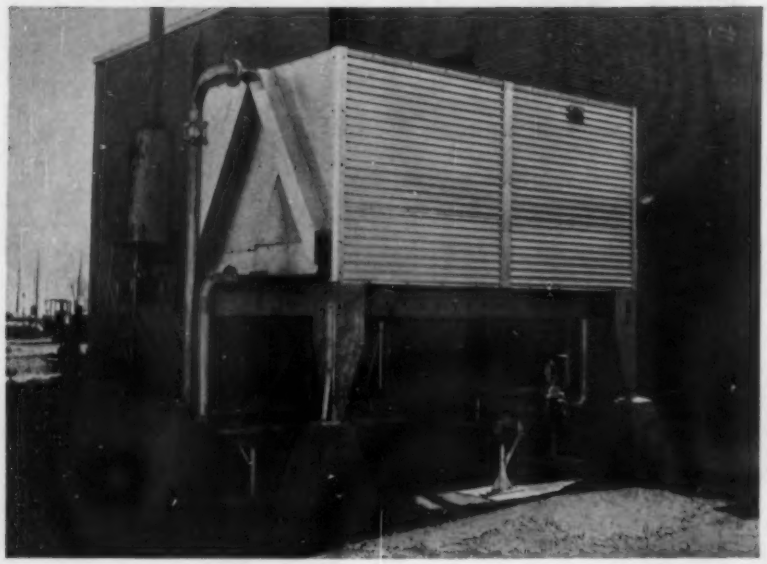
FOR TOTAL SERVICE, CALL
DEVILBISS

THE DeVILBISS COMPANY, Toledo 1, Ohio. Also Barrie, Ontario; London, England; São Paulo, Brazil. Branch offices in principal cities.

Circle 543 on postcard, page 33

NEW ECONOMY
NEW FLEXIBILITY *in*

Closed Circuit Cooling



Marley

DriCooler® Fluid Coolers

Marley DriCoolers have become the modern approach to closed-circuit cooling of recirculated clean fluids by air . . . because they keep costs and temperatures under *complete control.*

DriCoolers are specifically designed to meet industry's varied needs for high level cooling at low costs. They are engineered to combine a high standard of heat transfer capability with economical use of applied horsepower, long service life and conservative first cost. DriCooler controls provide automatic operation in all seasons, in any climate.

This combination of positive characteristics makes DriCoolers the logical cooling equipment for modern machines and processes —engine jacket water . . . electronic tubes and data processing equipment . . . furnace doors . . . molding and extruding equipment . . . air compressors . . . welding equipment . . . anodyzing tanks . . . quenching baths . . . transformers . . . many process requirements.

For complete details on DriCoolers—or on Marley's complete line of water cooling towers—see your Marley engineer or write direct. You'll find that Marley helps you make the most profitable use of your logical cooling medium, whether it be air or water.

Ask for Bulletin DFC-61.

the Marley company

Kansas City, Missouri

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OPERATION—PRODUCTION

(O and P begins on page 62)

able under all conditions of pedestrian traffic was a material called Dura-Grip, furnished by Mine Safety Appliance Company. To insure maximum performance, the concrete surface was cleaned thoroughly and dried before the bonding resin agent was applied. After the first coating was applied, aluminum oxide grits were sprinkled over the surface. These particles, furnished as part of a kit with the anti-slip agent, settled into the wet surface coating.

After an hour's drying time, excess

Middle portion of pedestrian ramp has been coated with anti-slip grit.

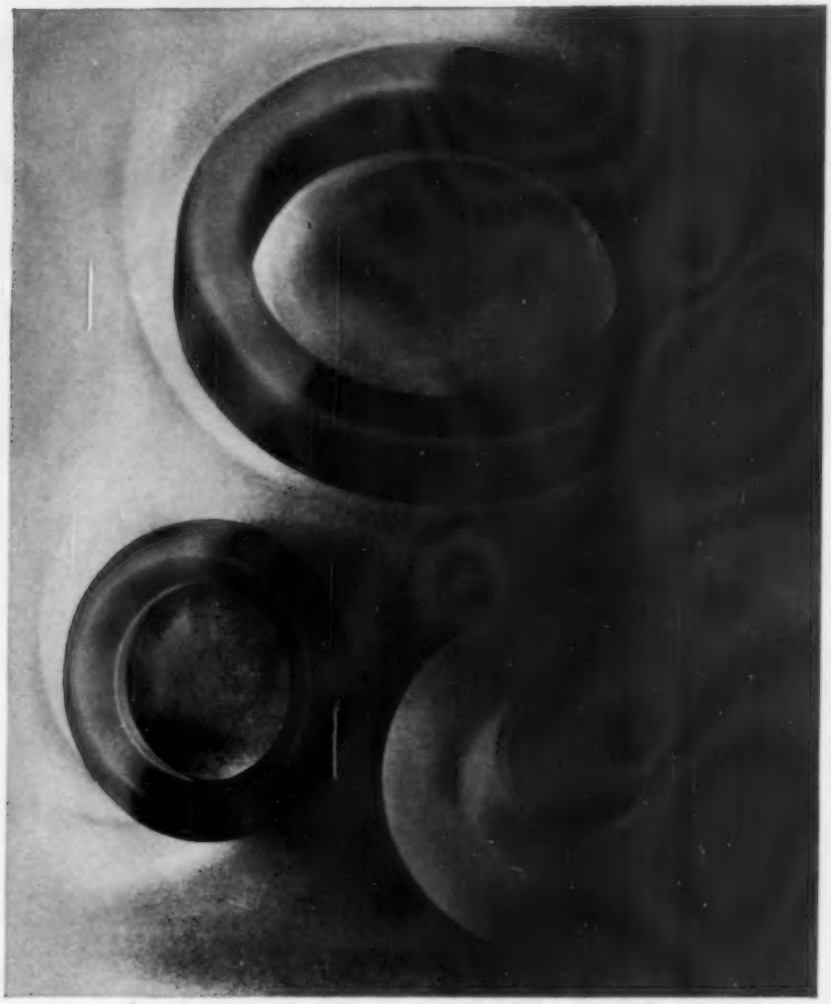
grit was swept up and recovered. A second coat was then applied to sandwich in the particles and fortify the resinous underlayer. Grit, anchored in the coating, protrudes minutely above the top coating to provide firm, safe footing.

Closure Speeds Batch Charging

REDUCING lost time between batches, and assurances of a vacuum-tight seal during processing, are objectives of a new spring-balanced hinged closure installed on a 3000-gallon reactor vessel at Jones-Dabney Company, Louisville, Ky., a division of Devoe & Raynolds Co., Inc. The 18-in. closure is a two-piece yoke with self-locking tapers to provide a uniformly tight seal between the head and hub of the closure.

Similar vessels previously used a

MOLY-S_2*, the newest of a variety of impregnations, is available in all shapes of Garlock leather packings . . . molded cups, "U" and "V" packings, washers, gaskets, discs, hat packings.



REMARKABLE NEW MOLY-S_2 IMPREGNATE

. . . adds exceptional anti-friction properties to Garlock leather packings. This new packing lubricant—molybdenum disulfide, a solid material—greatly reduces frictional drag at high pressures (above 1500 p.s.i.), and minimizes wear during break-in periods at low pressures. Heretofore highly effective as a metal lubricant, MOLY-S_2 is now successfully impregnated deeply and evenly throughout the fibers of Garlock leather packings, where it cannot be washed away by operating fluids or forced out under severe pressures. MOLY-S_2 has no melting point, will not separate or break down, is insoluble in water, and contains no graphite or fillers.

Because of its unusual adhering qualities, new MOLY-S_2 impregnate is excellent where fluid or gaseous mediums provide little lubrication to moving parts, or where high pressures limit the amount of vital surface lubricating film. For ideas on how you can apply Garlock leather packings with MOLY-S_2 impregnation, talk to your local Garlock representative. He's at the nearest of the 26 sales offices and warehouses throughout the U. S. and Canada. Or, write for catalog AD-186. Garlock Inc., Palmyra, N. Y.

Canadian Div.: Garlock of Canada Ltd.

Plastics Div.: United States Gasket Company.

Order from a complete line of quality Garlock products . . . Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

*Garlock Trademark for molybdenum disulfide

GARLOCK

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No. 9 *In a series of washroom survey comments from "SBS soap counselors"*

We showed them how to cut washroom housekeeping costs!

Edward P. Goeres

is a SBS soap counselor in the Midwest. A specialist in industrial soaps, he has helped many plants reduce their wash-up, clean-up costs. Here's the result of a typical survey:

"We found washroom clean-up costs exorbitant because this plant was using slow-acting scrub soaps, scouring powder and disinfectants. These single-purpose products required lots of elbow grease and wasteful duplication of labor.

"We naturally recommended SBS 50. We let them see for themselves how effectively this one product, SBS 50, ***cleans, disinfects, sanitizes*** and ***deodorizes*** in just ***one operation*** . . . without wasting either labor or material! We also stressed SBS 50's exclusive *4-Way Action* that kills germs on fixtures, floors and walls . . . and leaves an invisible "Bacteria Barrier" on sanitized surfaces that gives continuous protection."

Money-saving suggestions like this *begin* with OPERATION PINPOINT–a thought-provoking presentation filled with facts about skin hygiene and washroom maintenance. The SBS soap counselor serving your area can pinpoint the right soap to do every skin cleansing job best and at lowest cost in your plant. Let him show you OPERATION PINPOINT . . . just call your nearest SBS office, collect.

the washword of industry

SBS sugar beet products co.

SAGINAW, MICH. • Los Angeles, Calif. • Newark, N.J.
CANADA: Chemical By-Products, Ltd., Toronto, Ontario

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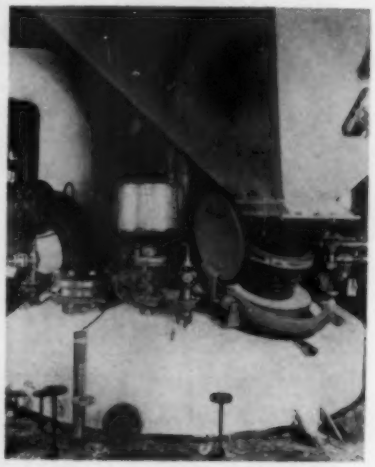
OPERATION—PRODUCTION

(O and P begins on page 62)



Spring-loaded closure with self-locking taper provides vacuum-tight seal.

blind flange arrangement for the top vessel opening, necessitating time-consuming hand removal of bolts and mechanical lifting of the flange during batch changes. The new closure, designed by Tube Turns Division of Chemetron Corporation, conforms to ASA B16.5 150-lb pressure-temperature rating. It is a completely assembled unit that is installed on the vessel with a single circumferential weld. It is opened or closed in approximately one minute by one operator using a standard wrench.

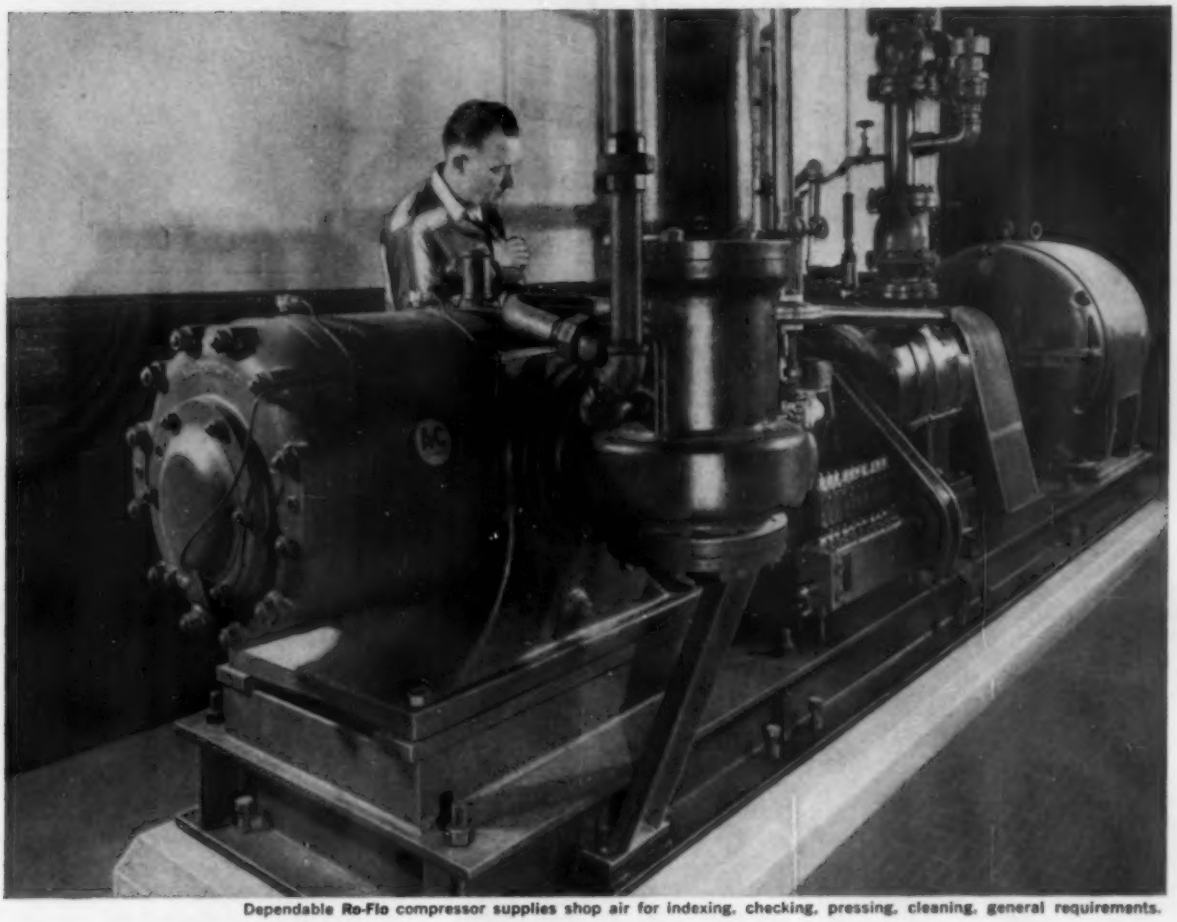
Multiple Hauling Saves Time

CAPABLE of picking up and carrying 30-ton loads, a giant Hyster straddle truck has been put into operation in the Steel and Tube Division of the Timken Roller Bearing Company, Canton, Ohio. Weighing 17 tons, the machine can lift bulk in a maximum size of 75 in. high and 60 in. wide. The vehicle is 12 ft, two inches high and nine feet, three inches wide.

Used primarily for multiple hauling, it can pick up a heavy duty bolster holding several loads of billets and carry it to its destination (making several trips in one.) These piggyback loads of steel are hauled between the company's Canton and Gambrinus steel mills, a distance of about two miles from points of pickup.

During an eight-hour shift, the

ALLIS-CHALMERS



Dependable **Ro-Flo** compressor supplies shop air for indexing, checking, pressing, cleaning, general requirements.

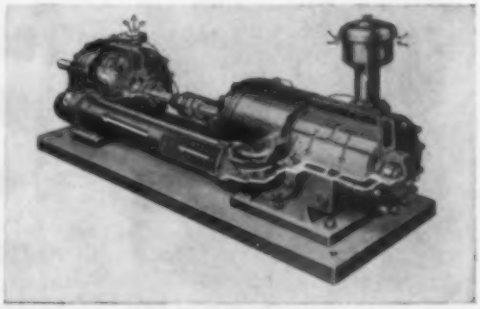
Record-breaking run in Allegan

no new parts for this RO-FLO compressor since installation

With 17 years of trouble-free experience using A-C rotary compressors, Rockwell-Standard Corporation installed this two-stage *Ro-Flo* sliding-vane compressor at their Universal Joint Division, Allegan, Michigan, in January, 1957.

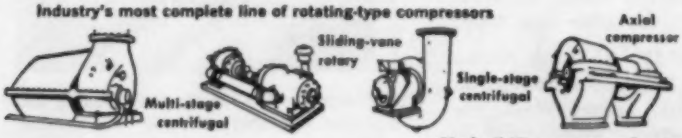
It hasn't let them down. It's been operating 24 hours a day, six to seven days a week, with no major stoppages and no new parts installed since the initial start-up three years ago.

Ask your A-C representative about low-noise, low-maintenance *Ro-Flo* compressors. Or write **Allis-Chalmers,** Industrial Equipment Division, Milwaukee 1, Wisconsin.



Sliding-vane action compensates for blade wear, helps maintain constant efficiency. Rotary motion cuts vibration and noise, eliminates shock and the necessity for expensive foundations. *Ro-Flo* is an Allis-Chalmers trademark. A-1306

Industry's most complete line of rotating-type compressors



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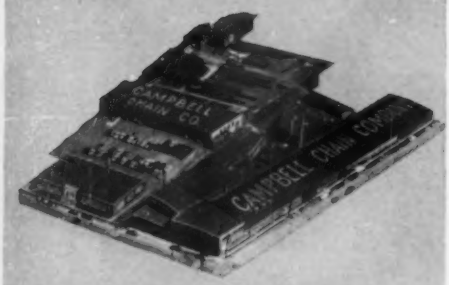
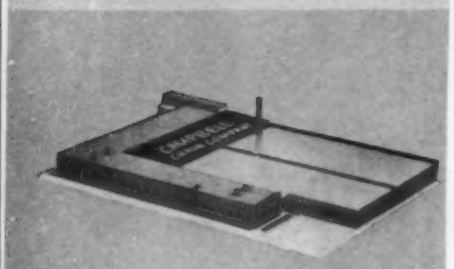


York, Pa.



West Burlington, Iowa

Union City, Calif.

Complete
CAMPBELL CHAIN plants cover the country...

to give you faster service and delivery!

PENNSYLVANIA
IOWA
CALIFORNIA

Yes, Campbell Chain has *complete* manufacturing facilities all across the country—in the East, the Mid-West and the Far West. This means money-saving, time-saving convenience for local industrial, commercial and automotive buyers—without the problems of delay in shipment. Backing up these three factories are Campbell warehouses with full stocks of all chain types and grades. It's a coast-to-coast network that assures the service and delivery you want—*and need!*

CAMPBELL CHAIN COMPANY

3 FACTORIES: York, Pa.; West Burlington, Iowa; Union City, Calif.

WAREHOUSES: Medford, Mass.; Atlanta, Ga.; Dallas, Texas; Chicago, Ill.; Portland, Ore.; Seattle, Wash.; Los Angeles, Calif.

OPERATION—PRODUCTION

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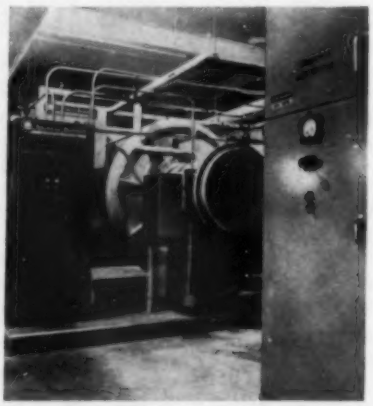
Giant straddle truck carries multiple loads up to 30 tons, all in one trip.

truck can make about 16 round trips between these two points. If it were required to carry a 30-ton load on each trip, its potential load carrying capacity would be 960 tons of steel billets per shift.

4160-Volt Motors Cut Costs

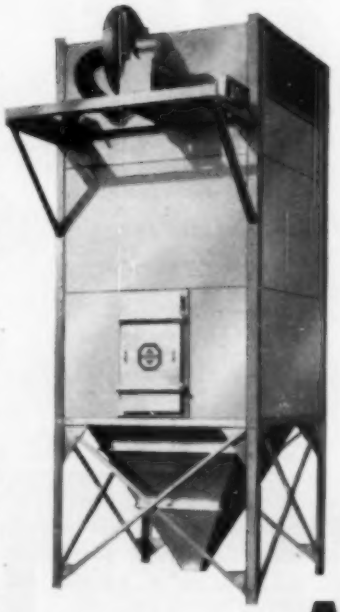
OPERATING refrigerating machinery on higher input voltages is a technique that has been growing in favor among electrical engineers. Latest installation to be reported using high-voltage motors on the air conditioning system is the Federal Office Building in Albuquerque, New Mexico. It has been estimated that a total cost savings of more than $20,000 has resulted from using the high-voltage machines.

A pair of 250-ton American-Standard centrifugal refrigeration machines



Hermetic 250-ton air conditioning machine operates on 4160-volt service.

What should a filter filter?



The true test of a dust filter's efficiency is measured by the size of the particles it collects. Koppers new MODEL K AEROTURN *reverse-air jet* dust filter is virtually 100% efficient on sub-micron particles as small as 0.40μ. The dust filter that can cope with sub-micron particles will do a better job for you in these critical areas:

- *Good Community Relations.* The exceptional air cleaning efficiency of MODEL K AEROTURN meets strictest community codes . . . provides *maximum* employee protection, too.
- *Maximum "Product" Dust Recovery.* Retaining dust particles below one micron in size means *extra* product recovery for extra dollar savings, added operating profit.
- *Important Maintenance Savings.* Less labor, less time is needed for plant housekeeping with MODEL K AEROTURN on the job. Lower dust content in plant air means reduced machinery wear, longer life for working parts. Filtered air can be returned to plant for savings in heating and cooling.
- *Lower Air Filter Operating Costs.* Improved self-adjusting blow rings, proven pressure controlled filter cleaning reduce wear . . . increase filter tube life . . . cut operating costs. Rugged, simplified construction virtually eliminates maintenance and down time.

An efficient dust filter *must* meet your specific needs. Koppers engineers can do this for you. Write for a copy of our MODEL K AEROTURN brochure. KOPPERS COMPANY, INC., Dust Filter Dept., 4206 Scott St., Baltimore 3, Md.

KOPPERS

AEROTURN®

DUST FILTERS

Engineered Products Sold with Service

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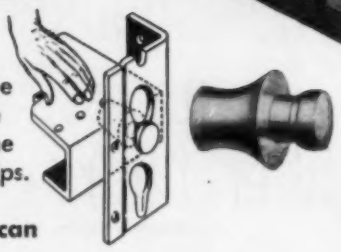
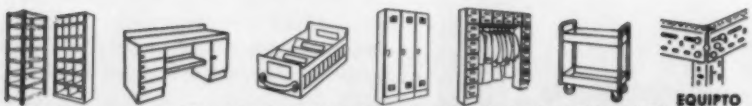
Buy Equipto -- Industry's choice for Quality Products



* Exclusive steel stud — a slope in the keyhole joins with the taper on the stud to form the tightest and strongest of grips. **The more you load it the tighter it grips, yet shelf can be moved easily.**

* No clips, nuts, bolts or tools for speedy shelf adjustment.
* 60% saved in assembly time.
* Shelves 100% adjustable from front of unit.
* Shelf can be inverted to form bin front.
* Shelves adjust on 1½" centers.
* Strongest shelf in the industry.
* Reinforcements can be added to increase capacity of shelf to 2,000 lbs.
* Four 1" x 2½" uprights allow unit to be moved without disturbing adjacent units.

* **Immediately available from stock in all sizes, either open or closed, with or without dividers, bin fronts, drawers or label holders. Fill out coupon for full details.**



Equipto 744 Prairie Avenue, Aurora, Illinois

☐ Please send me your Reference Manual No. 487. Also free booklet "HOW TO SOLVE YOUR STORAGE PROBLEMS".
☐ Please have layout engineer call.

NAME_____
FIRM_____
STREET_____
CITY_____ ZONE____ STATE_____

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OPERATION—PRODUCTION

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were selected for the air conditioning system. These hermetic units operate from a 4160-volt electrical power input. At the time of the initial evaluation of the 4160-volt system, engineers determined that more than $20,000 could be saved in total cost using 4160-volt motors versus a conventional voltage system using transformers. These savings are due to elimination of the transformer capacity required for the refrigeration compressors and reduced wiring costs.

Scooter Pays Off in Six Months

TRANSFORMING huge logs into the tiny chips needed for paper-making requires a lot of running around for a woodyard foreman.

In the typical case of the woodyard foreman, the man had to walk almost three miles per day to carry out his job responsibilities. At an average walking speed of 2.5 mph, this accounted for 1.2 hours of the foreman's time. At an hourly salary of $4.00 per hour, the foreman was paid $4.80 each day just for walking.

To increase supervisor's efficiency, a Cushman Truckster was purchased to transport the foreman around the woodyard at an average speed of 15 mph. The three miles a day required now only takes 0.2 hours as opposed to the 1.2 hours formerly required. This one-hour saving returned the scooter's cost in six months' time.

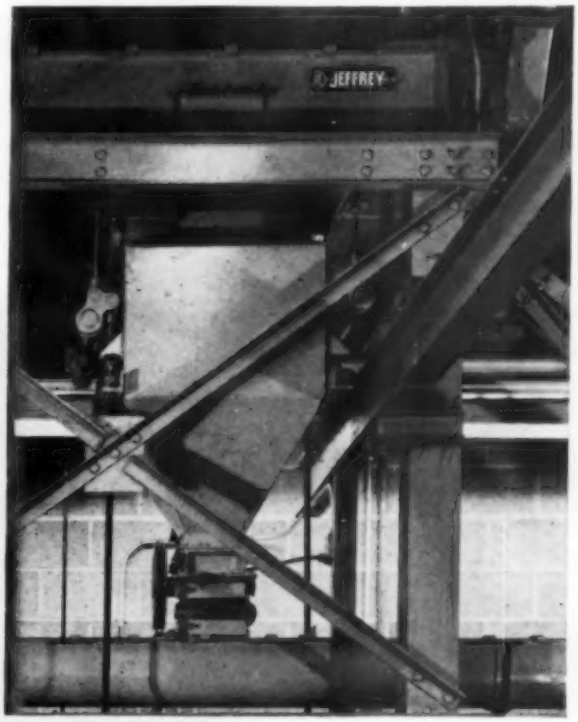
Motorized transportation for woodyard foreman saves one hour each day.

Jeffrey system eliminates manual handling of lead oxide at Universal Battery plant

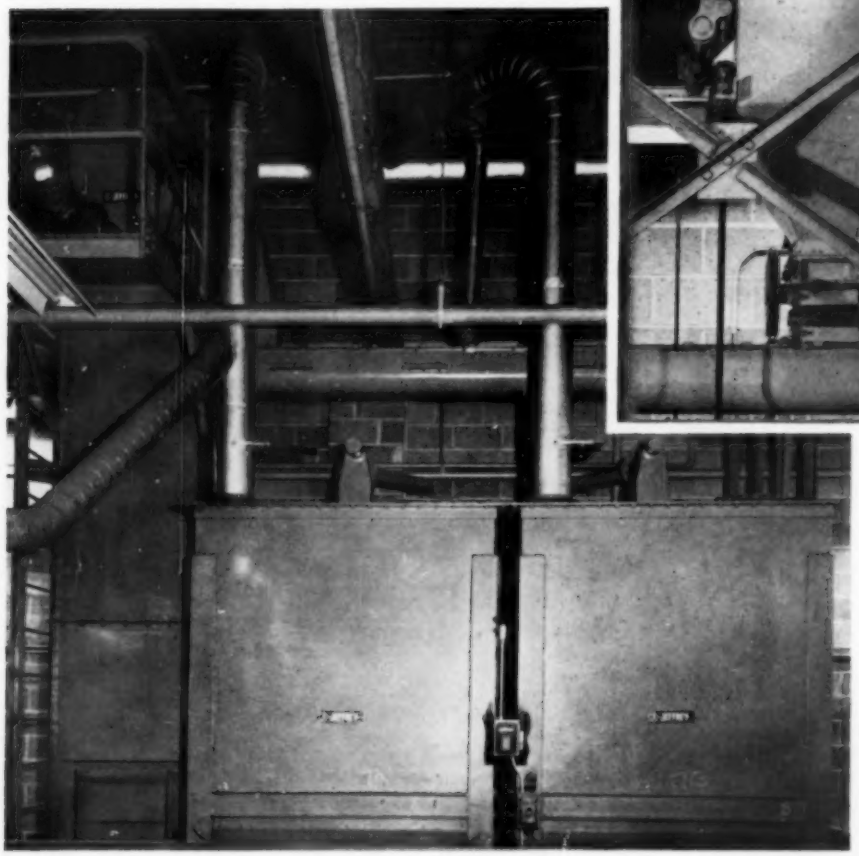
Tank trucks deliver lead oxide to Universal Battery Company's new plant in Chicago, where it is transferred to storage by air. No more back-straining handling of 600-pound drums. The Jeffrey system of storing, elevating, weigh blending and conveying has eliminated all manual handling in these operations.

Jeffrey furnished this equipment: the storage tank for the lead oxide, a bucket elevator to lift it to the spiral conveyor that feeds the Jeffrey weigh bin, and two rotary vane feeders. From tank truck to Simpson mixer, push button-control takes care of every phase of the system.

Planned by A. Epstein & Sons Inc. of Chicago, this installation combines that engineering firm's materials handling know-how and the proven dependability of Jeffrey products. The Jeffrey Manufacturing Company, 905 North Fourth Street, Columbus 16, Ohio.



From this Jeffrey weigh bin, batches are delivered to the Simpson mixer by the Jeffrey spiral conveyor.



Jeffrey bucket elevator lifts lead oxide to the spiral conveyor feeding the Jeffrey weigh bin.

If it's conveyed, processed or mined, it's a job for JEFFREY

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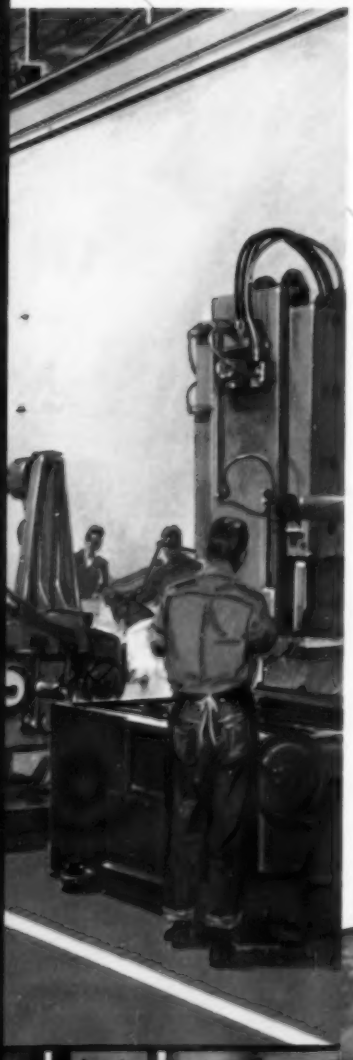
Circle 552 on postcard, page 33 ➔

RUST-OLEUM®

NEW COLOR

HORIZONS System



STOPS RUST AND PROVIDES LASTING BEAUTY

Gone are the days when color was used for the sake of color alone. Today, color is functional—helping to improve morale and increase efficiency—serving to color-code and mark safety areas, etc. The Rust-Oleum New Color Horizons System goes even further. It combines four important factors (1) the ability to stop rust, (2) smart, modern color harmony, (3) the durability to last and last, (4) ease of application that saves time, money, and metal. See how this system can bring lasting beauty to your plant, machinery, equipment, tanks, fences, etc. Your Rust-Oleum Industrial Distributor, with your Rust-Oleum Factory Specialist, will be happy to survey your plant and provide complete recommendations. Prompt delivery is assured from Industrial Distributor stocks in all principal cities of the U.S., Canada, and many countries around the world.

Faced with coating problems like these? Heat resistance, water resistance, chemical resistance, floors, galvanized metal, coatings that will dry in less than thirty minutes? Rust-Oleum, in its various systems, can be your answer. Call your Rust-Oleum Industrial Distributor, or write for the facts.

Apply Rust-Oleum 769 Damp-Proof Red Primer directly over sound, rusted surfaces to STOP RUST and cut maintenance costs

Just scrape and wirebrush to remove rust scale and loose rust—then brush Rust-Oleum 769 Damp-Proof Red Primer right over the remaining rust. Its **specially-processed** fish oil vehicle penetrates rust to bare metal as proved in radioactive tracing studies. You save time and money, as costly surface preparations are usually reduced.

RUST-OLEUM®

See our catalog in Sweet's.

STOPS RUST!®

Distinctive as your own fingerprint. There are imitations, but only **one** Rust-Oleum. Accept no substitute.

PROVED THROUGHOUT INDUSTRY FOR OVER THIRTY-FIVE YEARS

You take the brush! Try a free test sample!

ATTACH TO YOUR LETTERHEAD

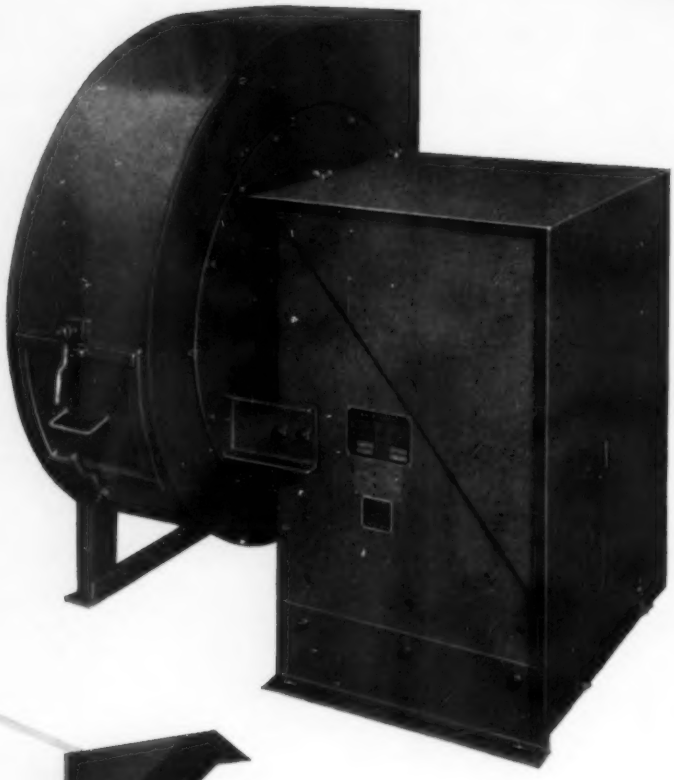
RUST-OLEUM CORPORATION
2984 Oakton Street • Evanston, Illinois

At no cost or obligation, please send me:

- ☐ New full-color catalog on New Color Horizons System and specialized Rust-Oleum systems, including color charts and applications.
- ☐ FREE TEST SAMPLE of Rust-Oleum 769 Damp-Proof Red Primer.
- ☐ Please have your representative contact us to discuss a plant survey.

CLARAGE

NEW...
Packaged INDUSTRIAL FANS



Contact the nearest Clarage sales engineering office for full information on this new line of equipment.

Ready-to-run

NOW the highly regarded Type XL industrial fans have joined the expanding family of Clarage self-contained, packaged units.

Hinged cover completely encloses motor, drive, and bearings for weatherproof installation outdoors or for added safety on indoor applications.

These compact, rugged, economical units are available with either the open type wheel for handling materials or the high efficiency backplate wheel for light dusts and fumes.

Dependable equipment for making air your servant

CLARAGE FAN COMPANY

Kalamazoo, Michigan

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

Circle 553 on postcard, page 33

Inductrol regulators provide precise voltage control in the Fullerton, Calif., plant of Rheem Automotive Co.

Compact 50-, 60- and 400-cycle Inductrol regulator for applications where high capacity and minimum volume are critical.

Inductrol regulator for loads up to 750 kva single-phase and 2000 kva three-phase.

General Electric Inductrol* voltage regulators give you . . .

A practical, economical solution to critical plant voltage problems

Bad voltage is bad business! Voltage fluctuations can cause electronic tube failures, lighting efficiency reduction, and increased production rejects. Electric heating equipment may be inoperative or inefficiently used, computers may give wrong answers and electrical machinery may operate erratically.

General Electric Inductrol voltage regulators offer you a practical, economical solution to these and many other costly voltage problems.

Inductrol regulators operate on the induction voltage regulator principle. No electronic tubes, sliding brushes or separate d-c power supplies are utilized—thus making them essentially maintenance free. And *only* G-E Inductrol regulators give you all these important advantages:

- Drift-free control—automatic ±1% bandwidth
- High short-circuit strength—up to 25 times normal current for two seconds
- High capacity—up to 100% overloads up to one hour
- No harmful waveform distortion
- Load, power factor and frequency compensated
- Rugged, compact design—install almost anywhere
- High efficiency—97% to over 99%

There's a General Electric Inductrol regulator in the exact rating and design to meet your voltage control needs. For complete information, contact your nearby G-E Apparatus Sales Office, or write General Electric Company, Section 457-07, Schenectady 5, N. Y. *Voltage Regulator Products Section, Pittsfield, Mass.*

* Registered trade-mark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Circle 554 on postcard, page 33

Mr. Plant Engineer

DIAMOND CHAIN CO., INC. makes available to you over 70 years of practical experience and know-how in the manufacture of power transmission products.

Products Manufactured: New No. 760 Catalog describes and illustrates finished steel ROLLER CHAIN, SPROCKETS, and FLEXIBLE SHAFT, "HI CAP" COUPLINGS. Write today for your copy!

Identification: Products are packaged either in clearly labeled cartons or transparent poly bags.

Availability: All products are readily available either from stocks in Indianapolis or from Distributors located throughout the U.S. who give emergency service on short notice.

Engineering Service: Technical engineering service is available on your request from the Indianapolis plant or the DIAMOND district office nearest to you.

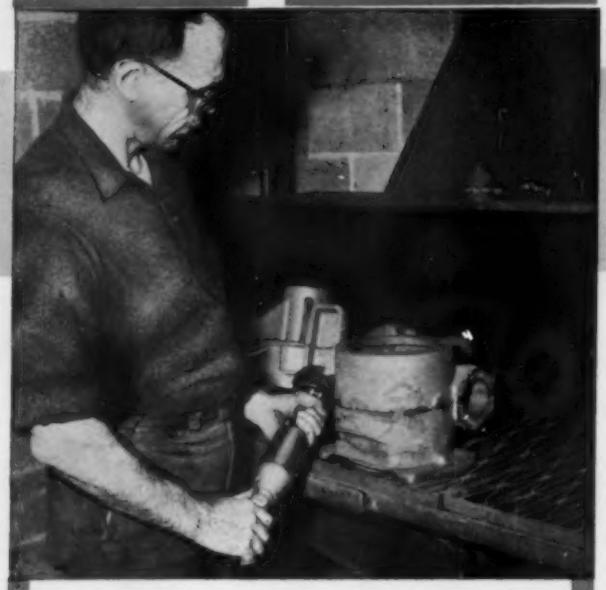
Sales Terms: Standard business terms well established through use in American industry.

DIAMOND CHAIN COMPANY, INCORPORATED
A Subsidiary of American Steel Foundries
Dept. 614 • 402 Kentucky Avenue, Indianapolis 4, Indiana
OFFICES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

DIAMOND ROLLER CHAINS

Circle 555 on postcard page 33

12 NEW GRINDERS in a power range all their own!



Now! You can choose the abrasive tools that best fit your needs from 138 sizes and types of Ingersoll-Rand Grinders.

features

- **Sensitive Weight-Type Governor**—prevents overspeeding, assures positive, accurate speed control.
- **Improved Muffling**—15 decibels quieter than comparable tools.
- **Built-In Lubricator**—automatic motor lubrication increases tool life.
- **Built-In Air Strainer**—protects motor.
- **Rubber-Faced Throttle Valve**—unaffected by moisture, dirt and rust.

New Series 15 Grinders

- **Speed—6000, 9000, 12000 and 15000 rpm**
- **Weight—6½ lbs.**
- **Length—16⅝ ins.**
- **Grip or straight handles with lever or thumb throttles**

Twelve new Ingersoll-Rand grinders in a completely new size and power range! These small, high-performance grinders are specifically designed to fill the need for light weight, easy-handling tools that will hold their speed under load on a wide variety of difficult grinding and buffing jobs.

Series 15 Grinders fill the bill—and offer manufacturers important new proof of tools to increase Annual Dividends on Payroll Dollars.*

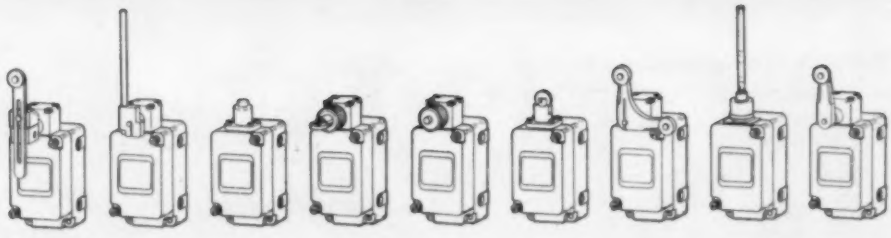
*Ask your AIRengineer for a convincing on-the-spot demonstration of how these new grinders—as well as all other Ingersoll-Rand air tools—can earn an Annual Dividend on your Payroll Dollars.

Ingersoll-Rand
11 Broadway, New York 4, N. Y.
Planned Annual Retooling increases output per man

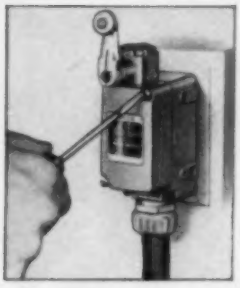
Circle 556 on postcard, page 33

HONEYWELL MICRO SWITCH Precision Switches

"Plug-in Limit" switches save



costly downtime
with fast, 20-second replacement



LOOSEN TWO SCREWS

PULL OUT SWITCH

PLUG IN REPLACEMENT

TIGHTEN SCREWS

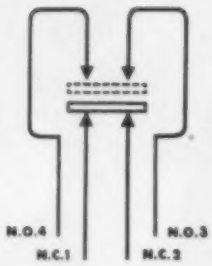
MICRO SWITCH oiltight "Plug-in Limit" switches save hundreds of dollars in replacement time with their easy 20-second replacement. Four sturdy spring plugs fit receptacles in the terminal block quickly and securely!

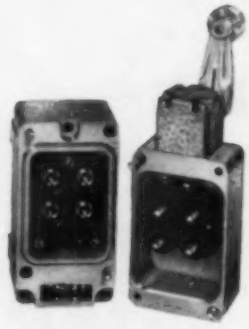
The "Plug-in Limit" switch line is built to handle the toughest of jobs. It has oiltight seals, rugged actuators and long-life snap-action switching elements.

Actuator heads are adjustable to different positions. Mounting blocks may be mounted from side or back. Nine standard and many special actuator designs are available.

Contact arrangement of the "Plug-in Limit" switch shown is single-pole double-throw double-break as in the diagram at right.

See the Yellow Pages for the MICRO SWITCH distributor or write for Catalog 84.





Notice the sturdy easy-to-match plugs and receptacles. Wiring is easy and fast. Ample wiring space. No. 8 terminal screws. Terminal block, shown at left, having no moving parts, is permanently installed on machine.

MICRO SWITCH . . . FREEPORT, ILLINOIS . . . A division of Honeywell

In Canada: Honeywell Controls, Limited, Toronto 17, Ontario

Honeywell

MICRO SWITCH Precision Switches

HONEYWELL INTERNATIONAL

Sales and service offices in all principal cities of the world. Manufacturing in United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.

Circle 557 on postcard, page 33

Recognize this symbol of protection?

It's a Realock Chain Link Fence—the safe, permanent way to protect your property. Realock's quality fabric is made from top grade steel wire that withstands lots of punishment. For long-lasting protection, the fabric is expertly galvanized to prevent corrosion.

Realock Fence is available in a variety of styles. For a free estimate and complete details about Realock Fence, call the nearest CF&I sales office.

The Colorado Fuel and Iron Corporation
Denver • Oakland • New York
Sales Offices in Key Cities

Circle 558 on postcard, page 33

Circle 559 on postcard, page 33 ➔

BONUS LIFE

BONUS PROTECTION

from the Boiler Capital of the World

THE TITUSVILLE WTP
FROM THE BOILER CAPITAL OF THE WORLD

• BONUS LIFE means longer life and less refractory maintenance made possible by Titusville's unique WTP design featuring *65% Black Surface Tube Area coverage on rear wall.*

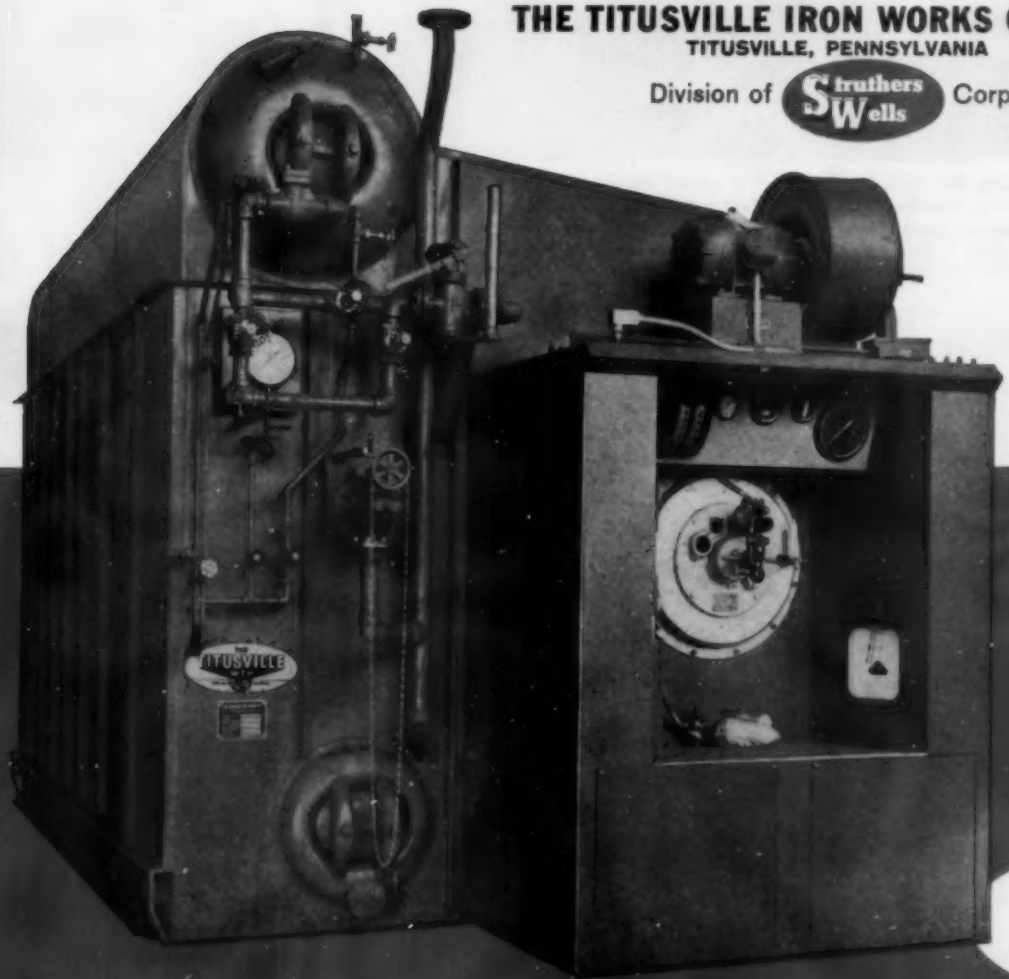
Titusville's increased black surface tube area means less refractory maintenance through longer refractory life (less down-time for replacement) and a faster steamer.

• BONUS PROTECTION provided by Titusville WTP's *double casing design* solves the corrosive product problem.

Most water tube steam generators operate intermittently. When dew point is approached at low fire condition, corrosive product can form quickly in single casing boilers.

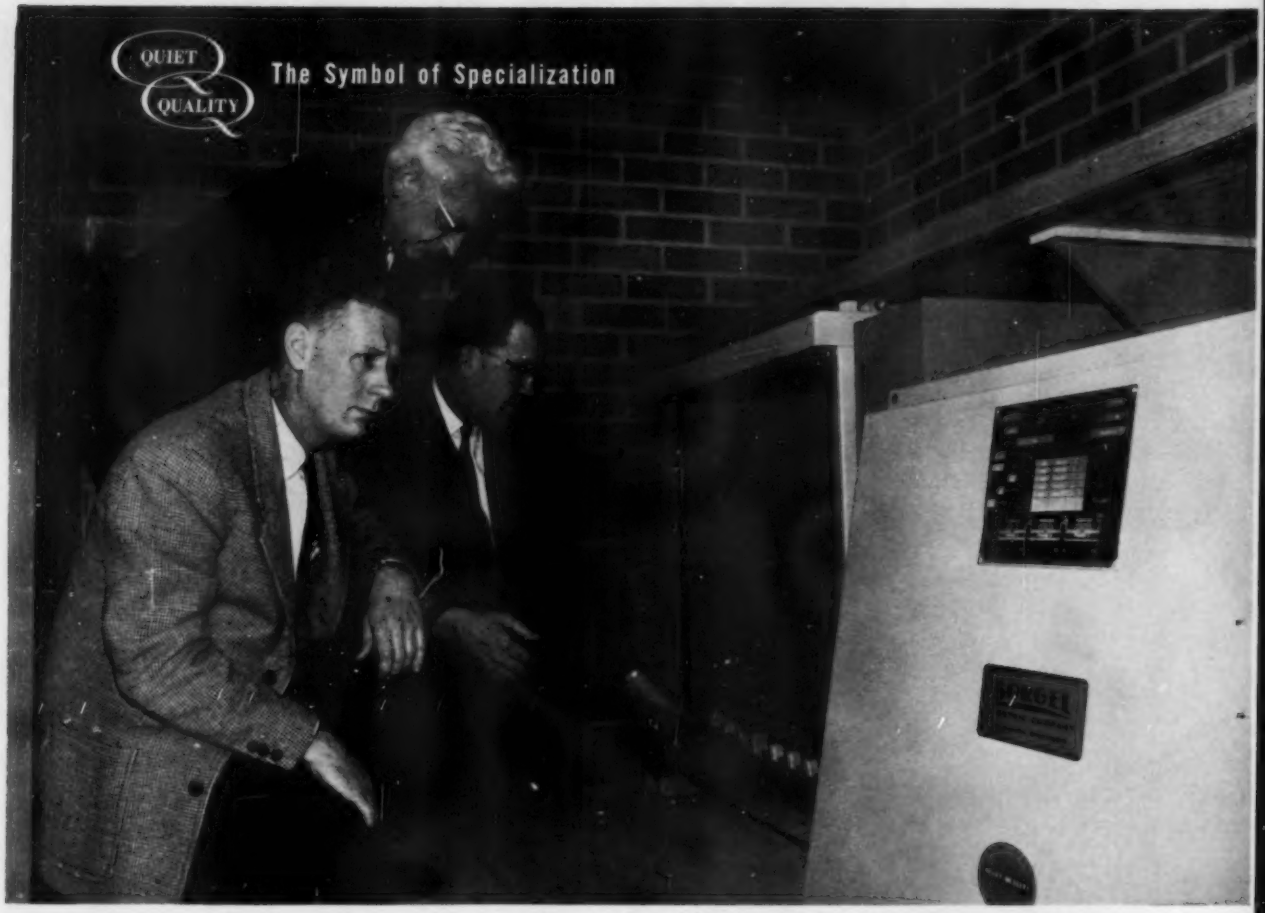
Titusville WTP's double casing design (with insulation between) reduces temperature differential. Result: formation of corrosive product almost entirely eliminated for many times more casing life.

THE TITUSVILLE IRON WORKS COMPANY
TITUSVILLE, PENNSYLVANIA
Division of Struthers Wells Corporation



Specify Titusville WTP ... the industry's fastest selling boiler

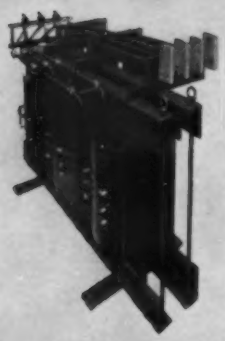
Selected exclusive sales territories available



Shown discussing the customer merits of a newly installed 112½ KVA Sorgel Dry-Type Transformer are Mr. Richard R. Pooley, Facilities Manager of Tektronix, Inc.; Mr. Jerry Jones, General Superintendent, W. R. Grasle Company, Electrical Contractors, Portland, Oregon; and Sorgel Sales Engineer, Mr. Henry C. Lehl. This transformer is installed in Tektronix's main facilities at Beaverton, Oregon. The Contractor commented on the fast installation of Sorgel units because of knockouts on all sides and easy accessibility to terminal connections.

1/4 KVA
TO
10,000 KVA,
ALL STANDARD
AND
INTERMEDIATE
VOLTAGES
UP TO
15,000
VOLTS

SORGEL HAS A DRY-TYPE



Popular sizes up to 75 KVA, both single and 3 phase transformers, are normally in factory stock. They are also constructed to be interchangeable for wall or floor mounting.

The transformer is the heart of your entire electrical system. Here is where true quality gives you dependability and low cost operation. Illustrated is a 500 KVA, 5 KV class, for a Sorgel unit substation.

If you BUY, SPECIFY or INSTALL transformers, YOU SHOULD KNOW THESE IMPORTANT FACTS

Here Are Eight Sorgel Customer Benefits That Mean Positive Savings in Dollars

These engineered advantages show why Sorgel dry-type transformers are considered the finest in the electrical field. These quality features, and many others, assure you of economy in installation and operation.

- All coils have end filler protection in each layer to prevent movement of conductors under heavy loads and short circuit stress conditions.
- The transformer core and coil unit is specifically designed for low sound level. In units 15 KVA and larger, the core and coils are mounted on vibration dampening pads designed to suppress transmission of vibration to adjacent areas.
- Each unit is completely assembled, wired, and tested at the factory, ready for line and load connections eliminating any job-site assembly.
- All terminations are securely anchored, and solderless connectors are furnished on all transformers with terminal boards. Vacuum impregnated windings are brazed to the terminals.
- Connection covers are cushioned and easily removed by means of two captive bolts on small sizes, and four on larger sizes.
- Ventilating openings are designed to prevent accidental access to live terminal parts. Expanded metal is not used on sides, back or front.
- In Quiet-Quality units, performance data, such as core loss, copper loss, sound level, etc., is always equal to, or lower than, the guaranteed values submitted to the customer.
- Sorgel units are individually tested in accordance with NEMA standards. Certified tests are furnished upon request, to further substantiate the guaranteed data.

Contact your nearest Sorgel Sales Engineer for additional reasons why Sorgel units are truly your most economical buy - as quality pays, it doesn't cost.

SORGEL
SOUND-RATED DRY-TYPE
TRANSFORMERS

SORGEL ELECTRIC COMPANY

Since 1916 the pioneer in the development, manufacturing and application of sound-rated dry-type transformers

841 West National Avenue • Milwaukee 4, Wis.

Experienced sales engineers in principal cities

TRANSFORMER FOR YOUR EVERY NEED

CLIP AND MAIL FOR TECHNICAL BULLETINS.

- ☐ 611—Transformer Line
- ☐ 960—Substations
- ☐ 658—DC Saturable Reactors

Name_____

Title_____

Address_____

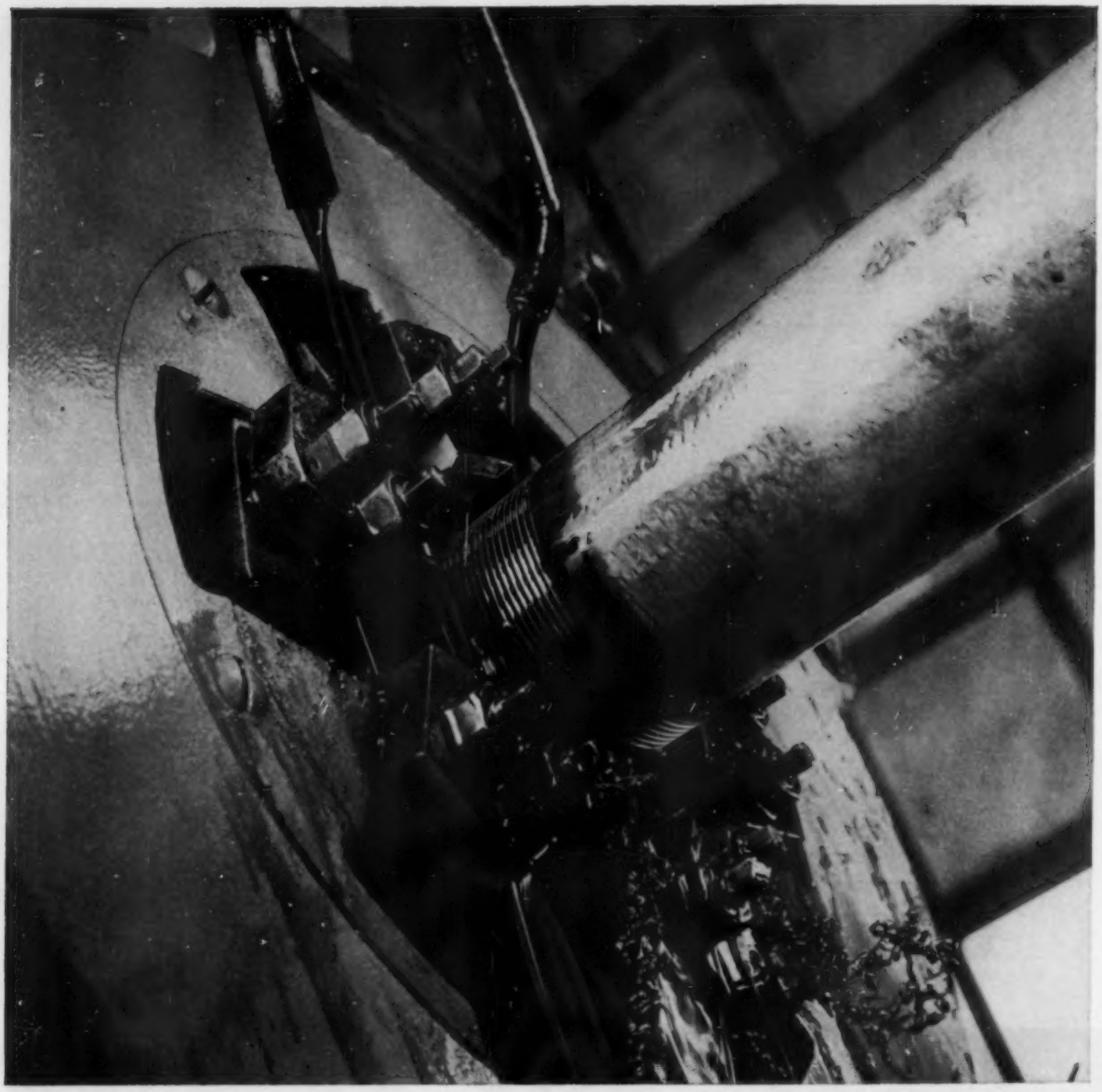
City_____

State_____

All units are built to meet or exceed latest standards of ASA, NEMA and AIEE. Sorgel provides the most liberal designs and a coordinated system of either Class B, F or H insulation with the most effective use of quality materials to assure continuity of service.

Sorgel is the leading manufacturer of quality Saturable Reactors used to regulate and control electric power for various manufacturing processes. Special features are: unusual wide control range, low D.C. requirements, low cost operation. Illustrated is a 150 Kva Reactor with recording and indicating instruments for automatic control.

Circle 560 on postcard, page 33



HOW TO CUT THE COST OF CUTTING!

Esso supplies a wide range of special and multi-purpose products designed to save you money on tool replacement, to boost output, and to reduce downtime...

PENNEX® cutting oils provide low tool wear in threading, tapping, and machining operations on ferrous metals. They are compounded with fatty materials for peak cutting efficiency; offer high sulfur activity for fine surface finishes.

NEBULA® EP multi-use grease serves *all* grease-lubricated parts, even those which require extreme pressure properties. Nebula EP has excellent oxidation stability, works well at high temperatures, and simplifies handling by replacing many single-purpose greases.

NUTO® high-quality hydraulic and circulating oils give effective protection against rust and oil breakdown; do a top-notch lubricating job in gear drives, bearings, and circulating systems.

Your Esso Representative can help you cut costs in many areas of your operations. Give him a call, or write us at 15 West 51st Street, New York 19, New York.

ESSO STANDARD, DIVISION OF
HUMBLE OIL & REFINING COMPANY

Esso

Circle 561 on postcard, page 33

CONSTRUCTION BRIEFS – reviewing methods and materials for the plant engineer

Edited by H. E. B. Anderson

PLYWOOD FOLDED PLATE ROOF

A MAJOR BUILDING component in current building—industrial as well as other types—is the folded plate roof. Offering strength, beauty and economy, this architecturally striking design is worthy of consideration in the design of your next project.

The following case history, from the Douglas Fir Plywood Association, illustrates the use of plywood folded plate roof sections, on a warehouse of Morrison-Merrill and Co. in Denver, Colorado.

The structure is of conventional construction—slab on fill, with block exterior walls—except for the unusual roofing system. According to Douglas W. McKibben, who designed the structure, the 64,300-sq ft roof area cost only 86 cents per square foot, excluding a sprinkler system. This low price was realized through the elimination of beams and through the lighter columns required by the plywood folded plate.

Built on a triangular-shaped plot next to a railroad spur, the building is 300 ft long and tapers in width from 277 ft at one end to 148 ft at the other.

A small wing section, 175 ft long and about 40 ft wide, was constructed at the same time, with a flat roof supported by fir plywood box beams bearing on the cinder block perimeter walls.

The roof system consists of 48 folded plates which range from 12 ft to 67 ft in length. The longest (and typical) clear span in the system is 50 ft between rows of concrete columns. The hollow columns also serve as housing for downspouts which lead water from the folded plate valleys to an underground runoff system.

A typical folded plate has chords and end members formed by two 2 by 8s. Both the ribs, which are on two-foot centers, and the blocking are formed by 2 by 8s. Top skins are sheets of ¾-in. PlyScord. The ceiling surface of the folded plates is ⅝-in. gypsum board.

The plates were prefabricated and locked into rigid v-sections in a rig erected on the site. Eight-inch lag bolts, on two-foot centers, hold the two plates together at the base of the v. The v-section then was lifted by a crane and set into ⅝-in.-thick metal brackets atop the columns.

The conventional cinder block walls are 16 ft high; building columns extend above the walls, so that the folded plate valleys are 20 ft above the slab. The open eaves were covered with translucent plastic sheet.

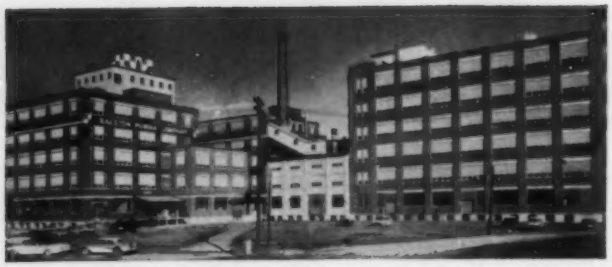
Box beams used in the flat roof over the receiving and shipping wing vary in length from 22 to 42 ft. Two types of beams were used. The first has 4 by 10 chords with webs of 1⅛-in.-thick fir plywood, four feet deep; the second group has 4 by 6 chords, but these lighter beams also have 1⅛-in.-thick webs, four feet deep. Both types of beams have 2 by 4 stiffeners on two-foot centers; both types are glue-nailed with the nailing pattern calling for four rows of 10d nails at six-inch centers, the length of the chord member.

Joists are 2 by 12s on 24-in. centers with a roof deck of ½-in. exterior type fir plywood. A built-up roof was applied over the deck. **End**

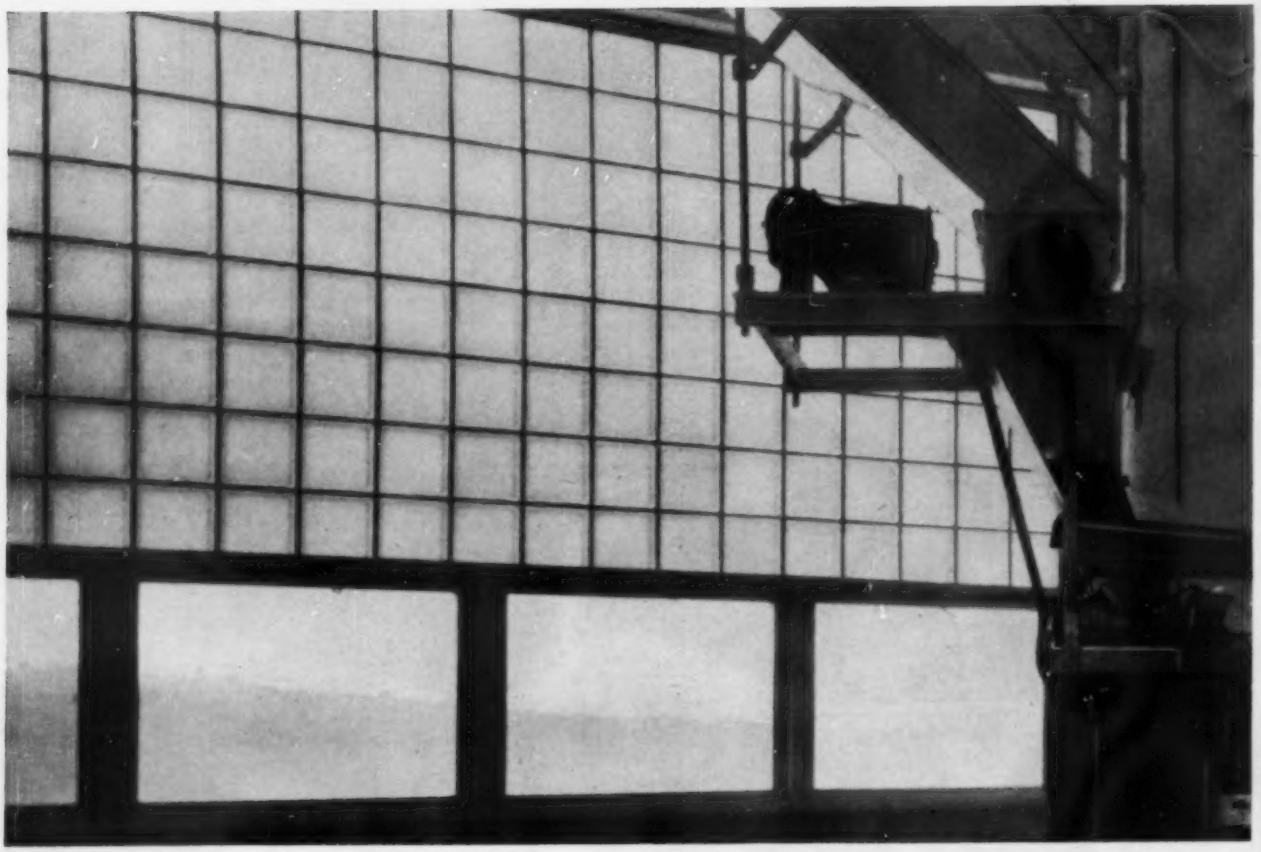
Fig. 1, left. Two plates, locked together in jig at building site, produce finished v-section 23 ft, 3 in. in width.

Fig. 2, above. Flat-roofed section is supported by plywood box beams; 2 by 12s span beams to carry plywood deck.

Fig. 3, left. Over-all view highlights folded plate design. Folded plate members vary in length from 21 to 58 ft.



Ralston Purina test proves PC Glass Blocks best for window replacement



Maintenance, corrosion and quality control problems prompted officials of the Ralston Purina Breakfast Food Company, Battle Creek, Mich., to conduct a series of tests to find the best sash replacement material. Plant Superintendent R. G. Lind and the Plant Engineer experimented with a variety of products as replacement for the deteriorating 40-year-old steel sash in three window bays.

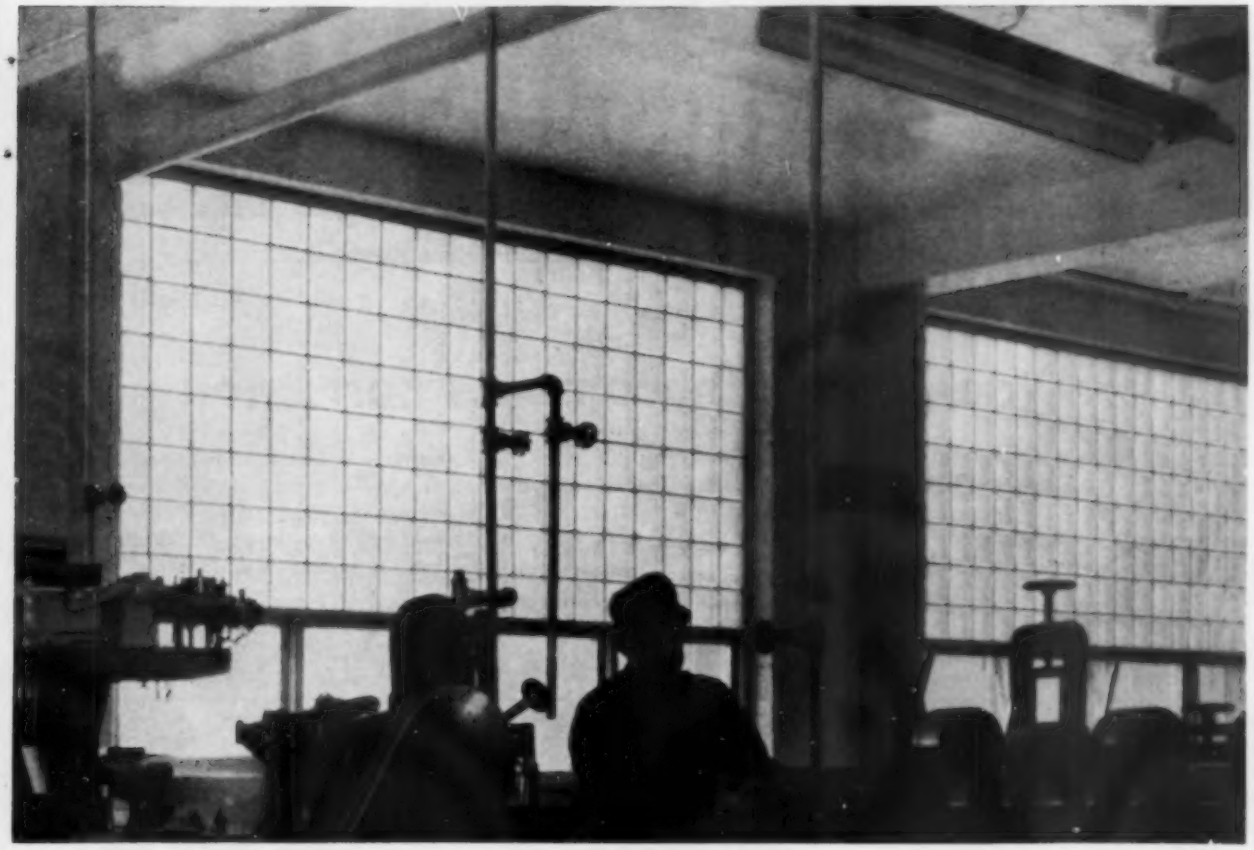
Tests proved PC Glass Blocks substantially cut window washing and maintenance, eliminated expensive calking and painting, added insulation value equal to a 12″ concrete block wall, and improved sanitation and worker morale within the food processing areas. In the cooking areas, Glass Blocks eliminated corrosion and a streaked window effect which had been caused by the continuing condensation from the food processing.

PC Suntrol® Blocks were installed in 311 bays, totalling 32,344 square feet in four buildings. Suntrol contains a blue-green diffusing screen that cuts instantaneous heat gain and glare. Their sparkling appearance has greatly modernized the plant buildings, inside and out.

PC offers free renovation test kit:

To simplify your planning for problem sash replacement, Pittsburgh Corning is offering a free test kit (below) that gives testimonials on various plant applications, a specific case that shows a yearly savings of $3,031 in heating and maintenance costs, and an easy-to-calculate table of replacement cost. This "planned cost-reduction survey" will make it simple for you to estimate your plant's problems and eventual savings with PC Glass Blocks.

For your free kit simply mail the coupon below, or write to: Pittsburgh Corning Corporation, Dept. PE-61, One Gateway Center, Pittsburgh 22, Pa. In Canada: 3333 Cavendish Blvd., Montreal, Que.



NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

TITLE_____

PITTSBURGH PC CORNING

Circle 562 on postcard, page 33

Through this pipe 171 billion gallons of brackish water have passed...

Nickel Cast Iron provides strength, combats corrosion

Every hour of every day for the past three years, this pump has handled 6½ million gallons of water for the cooling and condensing systems of a Virginia power station. The water has a salt range of 11.4 to 27.2 parts per thousand.

Among the steps taken to assure economical equipment performance was the employment of 2% nickel cast iron for the huge pump column, diffuser bell and elbow. The divided water boxes in the condenser are also made of 2% nickel class 40 grey iron.

Nickel improves properties

The nickel cast iron provides improved tensile and compressive strengths over regular grey iron. It helps assure a uniformly dense grain structure, increasing pressure tightness. It also affords greater resistance to graphitic corrosion.

Through the use of Nickel, alone or in combination with other alloying ingredients, the engineering properties of cast iron can be controlled to meet many combinations of service requirements. Would you like complete information? Write us for a copy of "Engineering Properties and Applications of Nickel Cast Iron." A postcard will do it.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

TYPICAL ENGINEERING PROPERTIES OF NICKEL CAST IRONS

Class	30	40	50	60
Tensile Strength, p.s.i., min.	30000	40000	50000	60000
Compressive Strength, p.s.i., min.	110000	130000	145000	165000
Torsional Strength, p.s.i., min.	34000	47000	60000	73000
Modulus of Rigidity, p.s.i., typical	$5x10^6$	$5.6x10^6$	$6.2x10^6$	$6.8x10^6$
Impact Strength, Izod AB, ft.lb.*, typical	26	35	43	52
Hardness BHN, typical	200	230	260	290

*The numbering system is similar to that used in A.S.T.M. Spec. A48-48.

INCO NICKEL

NICKEL MAKES CASTINGS PERFORM BETTER LONGER

Circle 563 on postcard, page 33

YOU CAN COUNT ON POWELL VALVES

Performance proves it, year after year—you can count on Powell Valves to help you solve the toughest flow control problems of handling water, oil, gas, steam, air or corrosive fluids.

This truly dependable performance results from many things—among them Powell's engineering know-how, accumulated during 115 years of valve manufacturing . . . and skillful use of the widest selection of quality materials—bronze, iron, steel and alloys.

Then, too, you can count on getting the Powell Valve you need, when you need it. That's because Powell maintains a network of distributors backed up by factory inventories, warehoused "ready to go."

Get the full story from your nearby Powell Valve Distributor, or write us direct.

200-pound Bronze Globe Valve —Fig. 102. Union bonnet. Renewable nickel-bronze seat and disc. Sizes, ⅛" through 3". Angle and flanged end valves available.

150-pound Bronze Gate Valve—Fig. 2714. Union bonnet. Inside screw rising stem. Sizes, ⅛" through 3" with solid wedge; ½" through 3" with split wedge.

150-pound Bronze Globe Valves —Fig. 150. Union bonnet. Renewable composition disc. Sizes, ⅛" through 3". Angle and flanged end valves can be supplied.

150-pound Bronze Gate Valve—Fig. 1414G. Bolted, flanged yoke-bonnet. Outside screw rising stem. Solid wedge. Sizes, 2" through 12". Screwed end valves can be furnished.

115th year of manufacturing industrial valves for the free world

POWELL DEPENDABLE VALVES

THE WM. POWELL COMPANY CINCINNATI 22, OHIO

Circle 564 on postcard, page 33

* **KILLARK "GR" SERIES JUNCTION BOX...**

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Circle 566 on postcard, page 33 →

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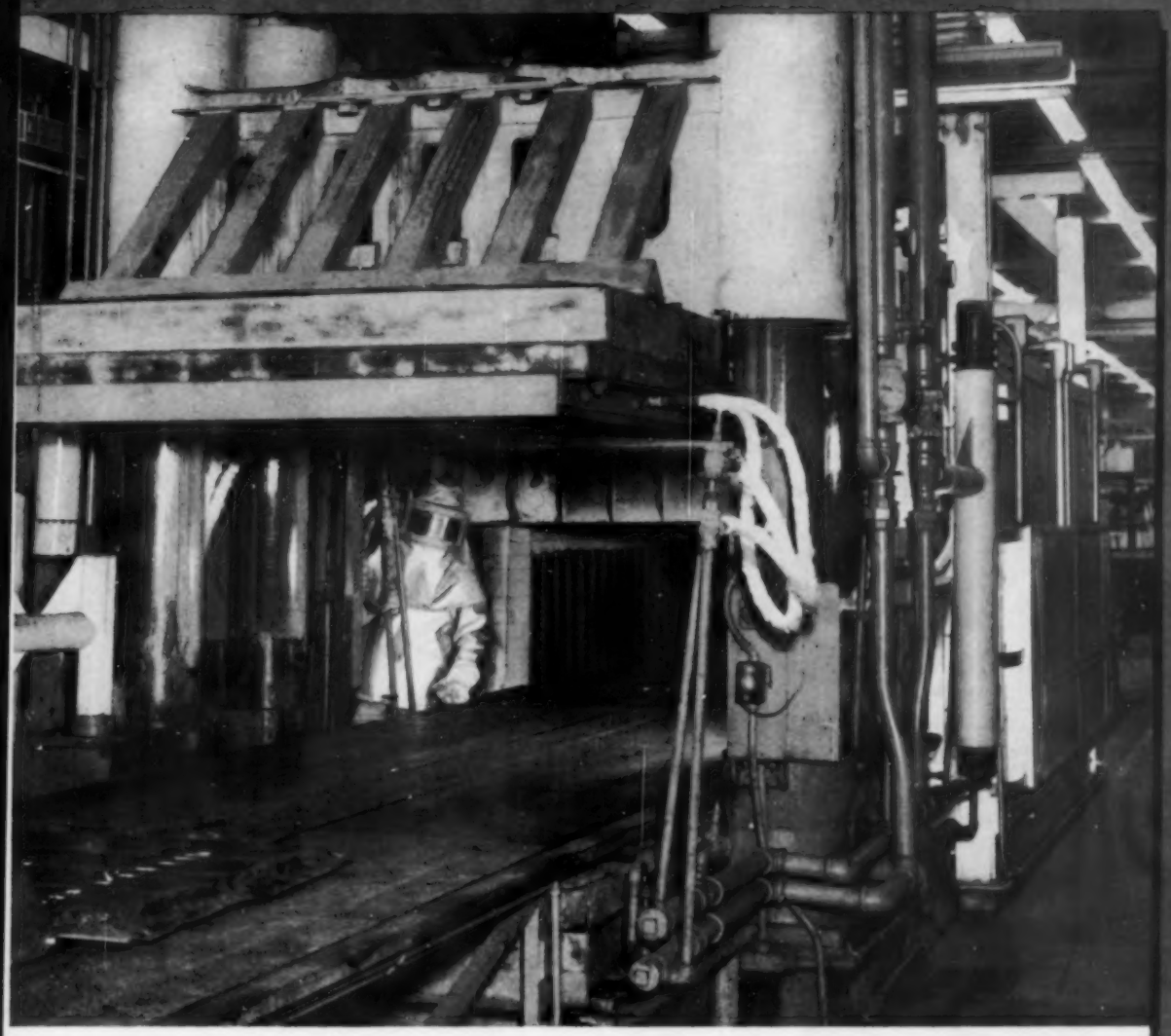

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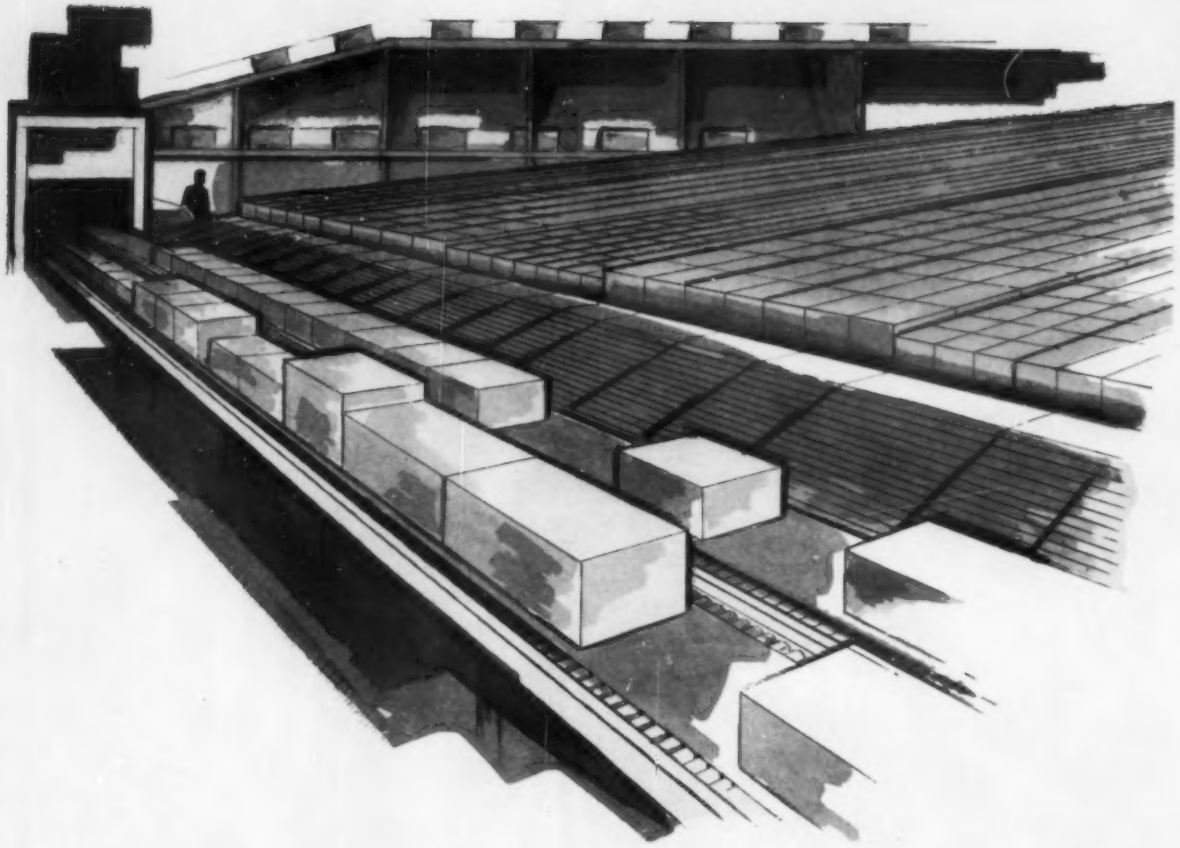

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Circle 567 on postcard, page 33

WHO GETS THE GRAVY?

The Chamber of Commerce of the United States, in a booklet titled "Productivity and Wage Settlement" analyzes succinctly and clearly the problems facing Government, labor and management in determining what real productivity increase means, how one measures it, and how one determines who should receive what share of the monetary rewards for such increases.

A telling example pictured in the booklet points out that today's "standard" car is quite different from that of a decade ago. In fact, in the case of one motor car manufacturer, today's standard car is the equivalent of the most expensive car made by that manufacturer ten years ago in terms of horsepower, acceleration, braking power, cubic feet of space, glass area and other objectively measurable factors.

That such shifts and improvements in product and product mix are general, rather than rare, we must agree. Because of product change, increased complexity and improvement it is nearly impossible to compare today's man-hour production with that of ten years ago.

And, if outputs are hard to measure, the Chamber points out, measuring the inputs raises similar difficulties. With the blue-collar worker in an inevitable numerical decline, and with the ascendancy of the scientists, the engineers, the technicians, there has emerged a heterogeneous class of "labor" that practically defies labor-productivity measurement.

In the absence of any reliable yardstick for determining just or justifiable wage rate increases it would seem that the old determinant of supply and demand is an excellent criterion —in a normal labor market. That is, if an employer cannot hire enough manpower of the required caliber, then his wage rate is inadequate; if he has no difficulty in securing adequate help, obviously his rate of pay is sufficiently high.

In our opinion, and at the risk of being called a "me-tooer", this places labor (and that means editors as well as mechanics and machinists) on the same basis as any other commodity. The employer pays what the traffic—and the market—demands, and he takes his choice.

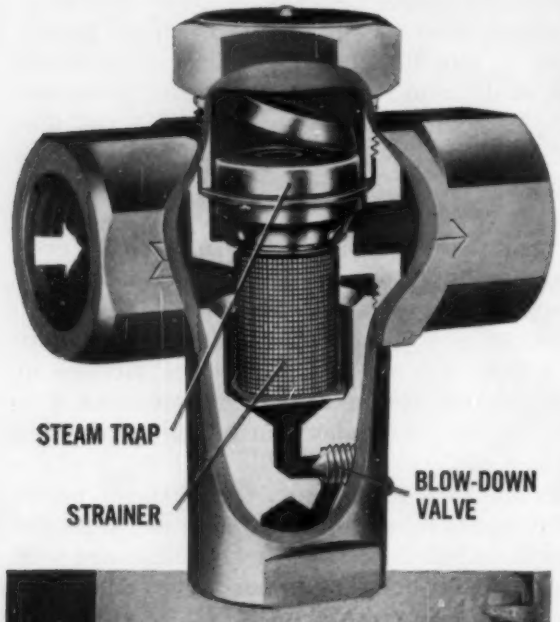
Tom Hanson

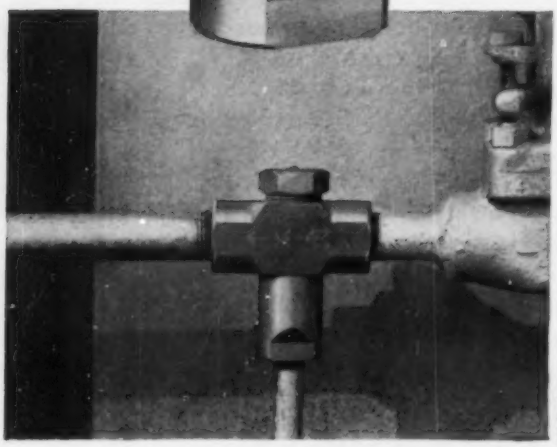
YARWAY news briefs

from **Yarnall-Waring Company,** *Philadelphia 18, Pa.*

BRANCH OFFICES IN 19 UNITED STATES CITIES • SALES REPRESENTATIVES THROUGHOUT THE WORLD
STEAM TRAPS STOCKED AND SOLD BY 270 LOCAL INDUSTRIAL DISTRIBUTORS

3 REASONS WHY NEW YARWAY SERIES 130 IMPULSE STEAM TRAP SCORES BIG SUCCESS





This new Yarway all-in-one combination steam trap, strainer and blow-down valve—designed especially for moderate condensate load applications—is winning enthusiastic approval from users everywhere. Here's why:

it saves space

Entire trapping hook-up can fit into an area no larger than a "T" fitting. Straight-through piping, cleaner installations, more accessibility.

it saves money

Only one unit to buy—plus much lower installation and maintenance costs—results in large savings over conventional trap installations. A fair estimate—*UP TO 30% IN TIME AND MATERIALS!*

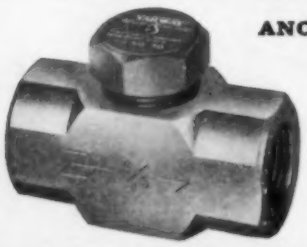
it saves work

No more installation headaches. As easy and quick to install as a pipe fitting. Maintenance is a breeze. Blow-down valve is operated by simple Allen wrench.

SERIES 130 traps are good for all pressures 8 to 600 psi, stainless steel throughout, have replaceable trap valve and seat, woven stainless steel strainer.

Why not try this compact combination on a steam main drip, tracer line or other moderate load application in *your* plant? Your nearby Yarway distributor can now supply you. For more details on Yarway Series 130 traps, write for Bulletin T-1743B.

Yarway Series 130 Impulse Steam Trap draining drip on 700 ft. house heating line at Eddystone Station of Philadelphia Electric Co. Pressure 150 psi; temperature 385° F.



ANOTHER POPULAR YARWAY IMPULSE STEAM TRAP—SERIES 30

This is the "trap" part of the Series 130 described above—but without combined strainer and blow-down valve. Gives peak efficiency on moderate condensate load applications. Offers these features:

- Economy of operation, with close condensate control
- Long service life, with lever action reducing impact in valve seat
- Low maintenance; easily replaceable seat and disc
- High quality, all stainless steel—with a new *low cost*

Write for Yarway Bulletin T-1743.

Circle 568 on postcard, page 33

WHAT'S JUST AHEAD IN THIS ISSUE

- "LARGE ECONOMY SIZE" prices of chemicals for plant use prompted Western Electric to examine the cost of bulk storage facilities. They found the investment would pay off and, as an extra bonus, would increase safety and reduce maintenance costs. Full details of this bulk storage system begin on the next page.

- SCIENTISTS are very special people; they cost a lot of money to recruit, they get good salaries, they are extremely hard to replace and they are well aware of their value. They are in a position to demand the best in surroundings and treatment. The article starting on page 107 shows what some companies have done to attract—and hold—scientific brains.

- HIGHER LIGHTING levels produce more heat in the lighting system and, as a result, increase the plant's air conditioning load. However, this need not be a problem if you heed some of the suggestions offered in the article beginning on page 112. The author tells how this heat can be put to use in winter and what you can do to reduce it in the summer.

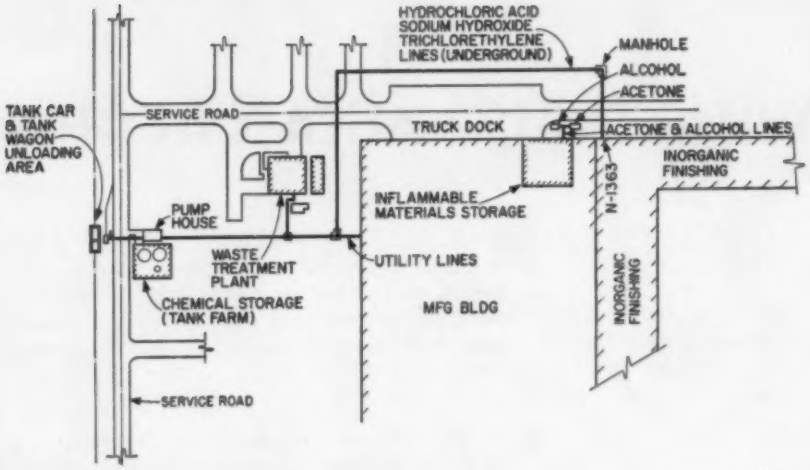
- WHAT LUBRICANT is recommended for braided packings, automatic packings? To find the answers to these and other questions about lubrication requirements for packings and seals, turn to page 116. Suggested methods for introducing the lubricant are also discussed.

- TO GROUND or not to ground? That is the question that has troubled plant engineers for many years, since each method has certain advantages as well as disadvantages. Turn to page 121 to read about one plant engineer's experiences with grounded systems.

- CYANIDE WASTES can present quite a plant disposal problem. However, at General Motors' Lansing plant this is not the case. Now, thanks to the use of a specially-designed incinerator, they are able to burn all their cyanide wastes. And, there are no pollution problems to haunt them. To find out more about this system, turn to page 124.

- INSTALLING a deepwell pump? If you are, you will want the answers to several questions to be sure you select the right pump for the job. Consider well environment, field tests, power characteristics—along with other points mentioned in the article starting on page 142. The author comments on the danger of increasing flows over capacity, cavitation, pump torques, thrust, lubrication and performance of vertical types.

Due to the location of the service road and the railroad spur it was necessary to locate the tank farm and its related facilities approximately 300 ft north of the manufacturing building. Either tank wagon or tank car shipments can be received. Tanks hold total of 36,000 gal.



At Western Electric

BULK CHEMICAL STORAGE

1. Cuts Cost of Chemicals
2. Increases Safety
3. Reduces Maintenance

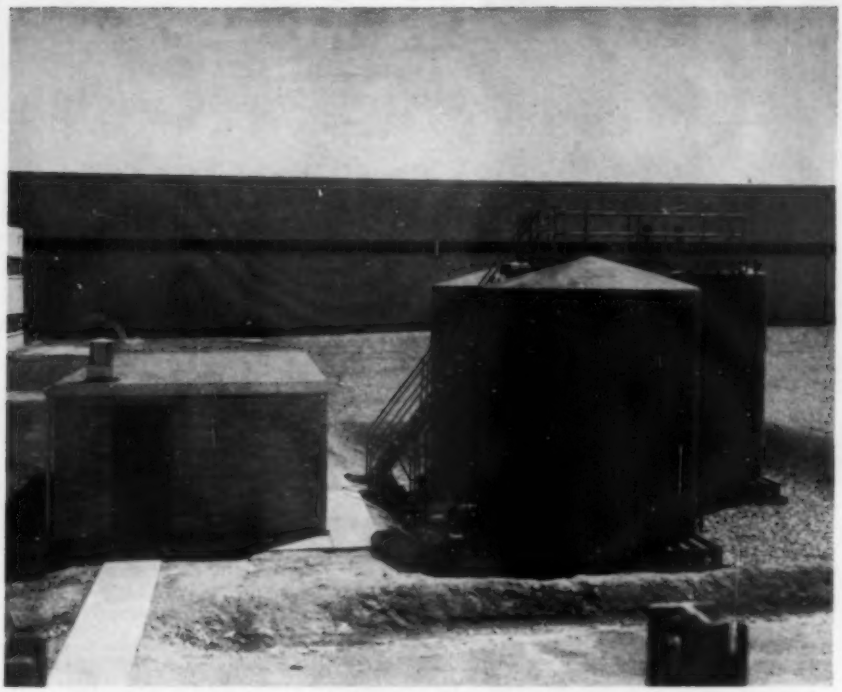
By J. E. ELLIOTT, Plant Engineer, Western Electric Co., Columbus, Ohio

DURING THE planning for the new plant that Western Electric Company, Inc. was building at Columbus, Ohio, a study was made regarding the quantities of various chemicals that would be used for manufacturing operations. It was determined that sufficient quantities of hydrochloric acid, sodium hydroxide, trichlorethylene, alcohol, and acetone would be used to permit the economical installation of bulk storage and dispensing facilities for these chemicals. The items considered in the study were: purchased material savings, safety, elimination of handling, and elimination of storage areas for drum lots of chemicals.

Investigation indicated that considerable savings could, as shown in Table I, be realized by purchasing the chemicals in bulk quantities rather than in drum lots.

Estimated yearly purchased savings based on published list prices shown will be approximately $37,000. In addition to purchased savings, the internal costs for receiving, storing, delivering and dispensing of the chemicals are considerably less through the use of bulk facilities, compared to handling in drum lots.

Storage areas that would have been required for the chemicals in drum lots were eliminated and the size of the inflammable materials storage room was kept to a minimum. The hazards involved in handling chemicals in drum lots were eliminated.



This exterior view of the tank farm shows the sodium hydroxide, the hydrochloric acid and trichlorethylene tanks and the pump house. Bulk storage facilities such as these are estimated to produce a savings of $37,000 yearly.

The total cost for the installation as installed is approximately $115,000.

The bulk handling and dispensing facilities were installed and included the following facilities:

A tank farm area, established for the storage and handling of hydrochloric acid, sodium hydroxide, and trichlorethylene, included the following facilities:

- One 15,000 gal hydrochloric acid tank
- One 15,000 gal sodium hydroxide tank
- One 6,000 gal trichlorethylene tank
- One pump house
- One railroad and truck unloading station.

Due to the location of the service road and the railroad spur, it was necessary to locate the tank farm and related facilities approximately 300 ft north of the manufacturing building. The unloading station is positioned in such a manner that either tank wagon or tank car shipments may be received.

The tanks in the tank farm are set vertically on steel grillage, supported by concrete piers. The area around the tanks was excavated to a depth of 3 ft and backfilled with 18 in. of limestone. The limestone will act as a neutralizer in case of spillage or leakage of the hydrochloric acid or trichlorethylene.

Tank Characteristics

The hydrochloric acid tank is 14 ft in diameter by 15 ft high on the side sheet with a flat bottom and a cone top. The tank is lined inside with Koroseal and openings have been provided in the top only eliminating the possibility of leakage from fittings at, or below, the bottom of the tank.

The sodium hydroxide tank is the same size as the hydrochloric acid tank, and is fabricated from mild steel plate with openings in both the top and bottom of the tank. Fifty per cent sodium hydroxide is stored in this tank. It is necessary to maintain the temperature of the sodium hydroxide in the tank at approximately 80 F in order to obtain satisfactory pumping conditions. (Fifty per cent sodium hydroxide freezes at approximately 54 F.) The tank is heated with five nickel-plated coils using 5 psi steam.

Coils are located a sufficient distance from the tank sides and bottom to eliminate unnecessary heating which could cause caustic embrittlement. Exterior of the tank is insulated with 1 in. of fiberglass covered with wire mesh and insulating mastic.

Trichlorethylene tank is 8 ft in

Table I. Considerable difference exists between costs of bulk and drum lots.

Chemical	Bulk Cost	Drum Lot Cost
Hydrochloric Acid	$ 1.815 cwt	$ 3.75 cwt
Sodium Hydroxide	2.90 cwt	3.75 cwt
Trichlorethylene	12.75 cwt	14.00 cwt
Alcohol	0.545 gal	0.734 gal
Acetone	10.50 cwt	12.00 cwt

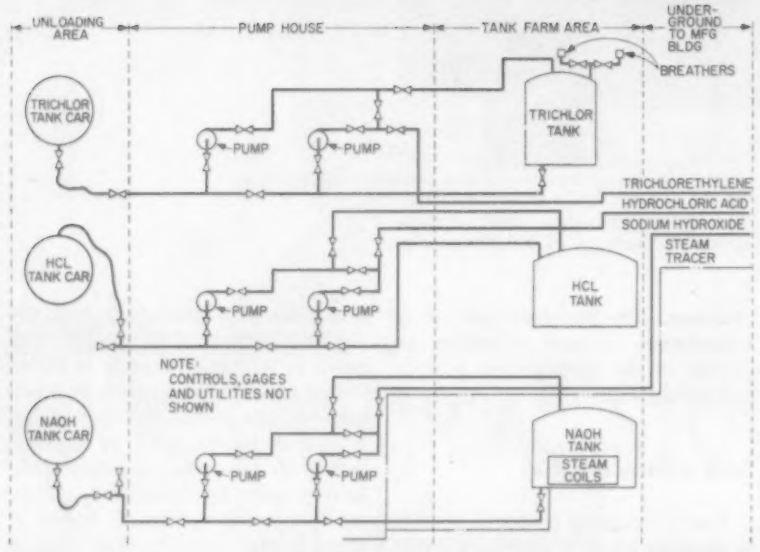


Photo at left shows arrangement of interior of pump house. Drawing at left is a simplified piping diagram of chemical dispensing and storage facilities at Western Electric, Columbus.

BULK CHEMICAL STORAGE

diameter by 16 ft high on the side sheet with a flat bottom and a cone top. The tank is fabricated from mild steel and openings are provided in the top and bottom. Two Lectrobreathers are located on top of the trichlorethylene tank and are connected to the vent line to prevent entrance of moisture into the tank and subsequent formation of hydrochloric acid. The breathers are valved to permit the removal of one breather for regeneration. A vent valve is provided for release of air during the filling operations.

Tanks were shop-fabricated and are all-welded construction. A common platform is provided over the tops of the tanks for access and to facilitate plant maintenance jobs.

The pump house is 13 ft wide by 28 ft long and constructed of masonry to match the neighboring buildings. A 3-ft wide pipe trench, below grade, is provided along one side of the pump house for the chemical and utility lines. The pump house contains the following equipment: two hydrochloric acid pumps, two sodium hydroxide pumps, two trichlorethylene pumps, one steam condensate return unit, one reactivator for the Lectrobreathers, three remote tank level gages, and electrical controls for the pumps. The pump house is maintained at a minimum temperature of 85 F by a unit heater. Fresh air is introduced into the pump house by means of a small exhaust fan and inlet louvers.

One pump for each chemical is provided for unloading service, and one pump for each chemical is provided for transfer from the storage tank to the dispensing locations in the manufacturing building.

Unloading rate for the chemicals will be approximately 50 gpm and the transfer rate will vary from 5 to 10 gpm. The unloading and transfer lines were designed to permit the use of identical pumps for unloading and transfer service for each chemical, thereby permitting the manifolding of each set of pumps, and eliminating the need for standby units. The installation permits the unloading and dispensing of chemicals simultaneously without interference between the operations.

Unloading pumps can be controlled from either the pump house or the unloading station. On-off switches are provided at each dispensing point and in the pump house, thereby permitting the transfer pumps to be controlled from either the pump house or any dispensing location.

Self-priming centrifugal pumps of a corrosion-resistant metal alloy are used for the hydrochloric acid service. The trichlorethylene and sodium hydroxide pumps are all-iron centrifugal pumps.

Chemical lines from the tank farm area to the manufacturing building are installed underground. Each line is encased in a separate vitrified clay pipe. Manholes are provided at each change of direction of the lines and are designed to permit removal and reinstallation of the chemical lines in 10-ft lengths.

Split clay pipe was used in order to simplify the initial installation. A steam tracer line was installed alongside the sodium hydroxide line in the same clay pipe in order to prevent freezing. PVC pipe was used for the hydrochloric acid line while seamless steel pipe was used for the sodium hydroxide and trichlorethylene lines.

Straight to Point of Use

Chemical lines are piped directly to the various points of usage. Hydrochloric acid and sodium hydroxide is dispensed into tanks in the plating area, while the trichlorethylene is dispensed into degreasers located throughout the manufacturing buildings. A meter is located at each degreaser for determining the usage of trichlorethylene by the various departments. Meters are not required for the hydrochloric acid and the sodium hydroxide since only one department is involved.

Utilities servicing the tank farm area are installed underground from the manufacturing building to the pump house in clay duct similar to the chemical line installation.

A 2000-gal alcohol tank and a 3000-gal acetone tank are buried underground just outside of the inflammable materials storage room. Pumps and the dispensing station for the alcohol and acetone are located in the storage room. A meter with a remote control valve is provided for each line at the dispensing station. Alcohol and acetone are dispensed into containers for distribution to operating departments. The tanks are fabricated from mild steel and black iron pipe is used for the dispensing lines.

Table II. Size of tanks installed in relation to the size of the shipments made.

Chemical	Tank Capacity in Gallons	Size of Shipment[1] in Gallons
Hydrochloric Acid	15,000	8000 to 10,000
Sodium Hydroxide	15,000	8000 to 10,000
Trichlorethylene	6000	4000
Acetone	3000	See note below[2]
Alcohol	2000	See note below[2]

[1]"Size of Shipment" shown for hydrochloric acid and sodium hydroxide is for railroad tank cars. Smaller shipments can be obtained by tank wagons. 4000 gal shipments of trichlorethylene can be obtained by either tank car or tank wagon.

[2]Alcohol and acetone will be purchased in tank wagon lots only. Each tank wagon is divided into compartments and mixed loads of alcohol and acetone totaling 4000 gal are considered bulk purchases.

Design of Tanks

The following criteria were used to determine the size of the tanks: Investigation indicated that the tanks should be of sufficient size to permit adequate storage of the chemicals in case of transportation or supply difficulties. It was further determined that we should be able to accept either railroad car or tank wagon bulk shipments when the tanks are approximately one-half full. Table II shows the size of tanks installed in relation to the size of bulk shipments.

The bulk storage and handling facilities, as installed, have eliminated the necessity for a number of other facilities which would have been required if the chemicals were purchased in smaller quantities. Among the facilities eliminated are the following:

A separate dispensing and storage room in the inflammable materials storage room. At the present time, a combination storage and dispensing room is permitted since the quantity of inflammables stored and dispensed in this room has been reduced by the outside storage of alcohol and acetone.

Storage areas for chemicals in drum lots are not required either inside or outside of the manufacturing building.

A bulk storage tank would have been required for the hydrochloric acid since the quantity of acid used is excessive for handling in carboys. Transport and storage wagons would have been required for transporting the acid from the storage tank to the various points of usage. Loading and unloading facilities for the wagons would have been necessary.

Various other material handling facilities were eliminated, including fork trucks, pallets, and drum racks.

Space has been provided in the tank farm area and the pump house for the bulk storage, handling and dispensing of one additional chemical. A spare underground duct has been provided from the tank farm area to the manufacturing buildings. If additional dispensing points are required for any of the chemicals, they may be added at a very nominal cost.

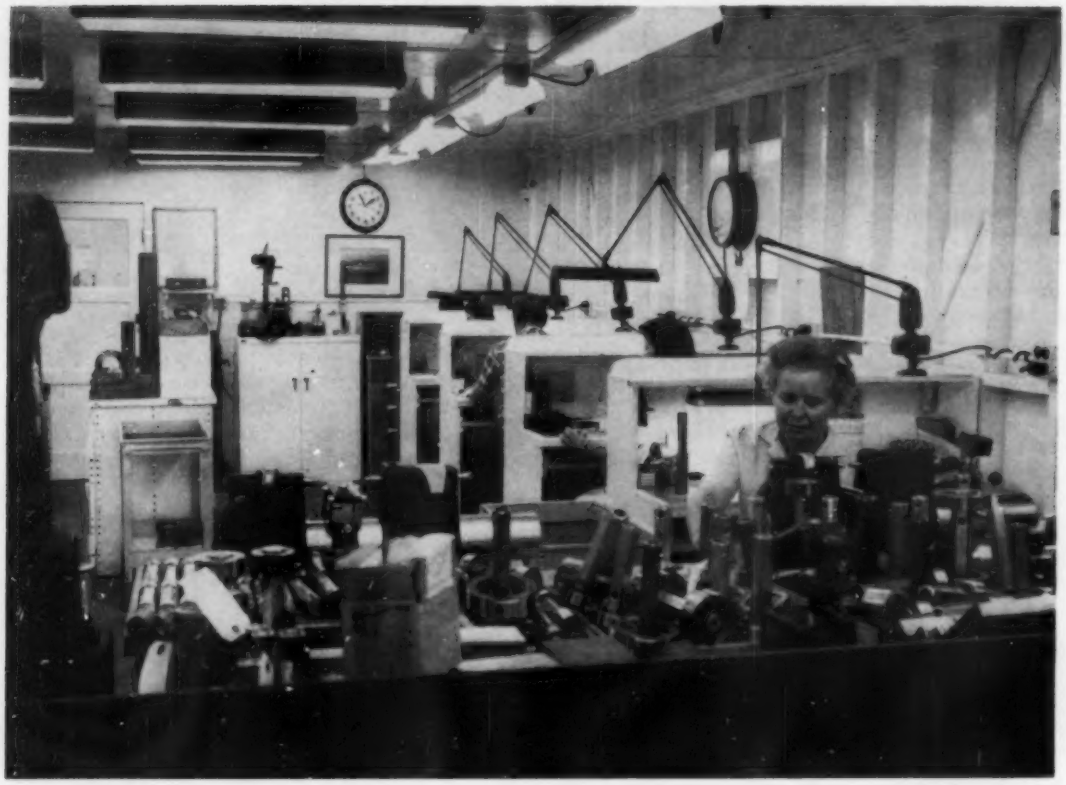
Summary

The system as installed at the Columbus Plant, Western Electric Company, Inc., will accomplish the following:

1. Reduce the handling of the chemicals to a minimum.
2. Decrease the time required for the dispensing of the chemicals.
3. Permit the chemicals to be purchased in economical lots.
4. Permit ease of maintenance, since all equipment and piping will be readily accessible.
5. Reduce the hazards in the handling of the chemicals.

In addition to the purchased savings of approximately $37,000 per year, substantial savings will be realized from the reduction in labor required for handling and dispensing of the chemicals. **End**

Fig. 1. Looking the length of calibration room in clean room area. Ceiling and part of walls are lined with insulation board. Fluorescent lighting is used as it dissipates little heat into the surrounding air.



PINT-SIZED CLEAN ROOM Handles Big Maintenance Job

By **WILLIAM KEITH RUSSELL**, Facilities Engineer
Long Beach Division, Douglas Aircraft Co.

KEEPING 9000 critical gages scattered through 30 manned tool cribs in a 270-acre plant continuously maintained, repaired, calibrated and certified sounds like a herculean task. But at the Long Beach, California Division of Douglas Aircraft Company, where jet transport airplanes are built, this job is accomplished by six men working two shifts in a small, specially built clean room measuring only 18 ft by 45 ft in over-all size.

Some of the gages must be certified each time they are used; others each week, every two weeks, or at 60 or 90 day intervals. All must be kept clean, accurate, and properly calibrated.

Controlled Environment

Work on them must be accomplished under controlled environmental conditions. Temperature in the clean room is kept at 68 F, plus-or-minus 2 F, to prevent gage metal expansion or contraction from affecting final accuracy. The clean room air dust particle size must be held down to 40 microns to prevent dirt interference.

The room is centrally located in the plant's major machine shop area where it will be nearest to the cribs stocking a majority of the most critical gages now in use. It is built directly on the floor of the building in which it is located, with ⅜-in. plywood walls, and a room-height, ⅜-in. plywood ceiling. Most of the interior (eventually all of it) is covered with ½-in. insulating board to make temperature control easier. The interior of the room is painted white to improve light distribution for the delicate work involved, and fluorescent lights

are used to reduce heat dissipation into the surrounding air.

The clean room area itself is panel-divided into two specific rooms—one 8-ft by 18-ft room in which the instruments are received, disassembled, thoroughly cleaned, and made ready for calibration or repair. The second room, 18 ft by 35 ft in size, is the calibration room where the maintenance or repair work is actually performed. This room contains the very high precision measuring instruments, including one instrument which will measure 0.00001 in., two microscopes calibrated in 0.00001 in. and an internal comparator which will measure within 0.00002-in. tolerances.

Preliminary Cleaning

The division within the clean room area serves two definite purposes. When instruments or gages enter from the shop, they must undergo a 'soaking' period to allow them to come to clean room temperature. This 'soaking' period is expended while they are being disassembled, cleaned, and made ready for repair. Secondly, the danger of dirt contamination in the calibration room is greatly minimized by thoroughly cleaning all instruments before they enter it.

Temperature control in the clean room area is maintained by a five-ton refrigeration unit mounted on the plant roof. This is a double unit so that if one side fails, the other takes over and keeps the temperature in the clean room constant. Air for conditioning the clean room is drawn from the interior of the plant building where it is already in a filtered condition. It is then passed through a second series of filters which reduces the dust count to the necessary 40 microns or less.

Entrance to the clean room area is through a tight-closing door marked for special personnel only. This single entrance opens into the cleaning room part of the clean room area. Thus the calibration room itself is entirely isolated from the rest of the plant. **End**

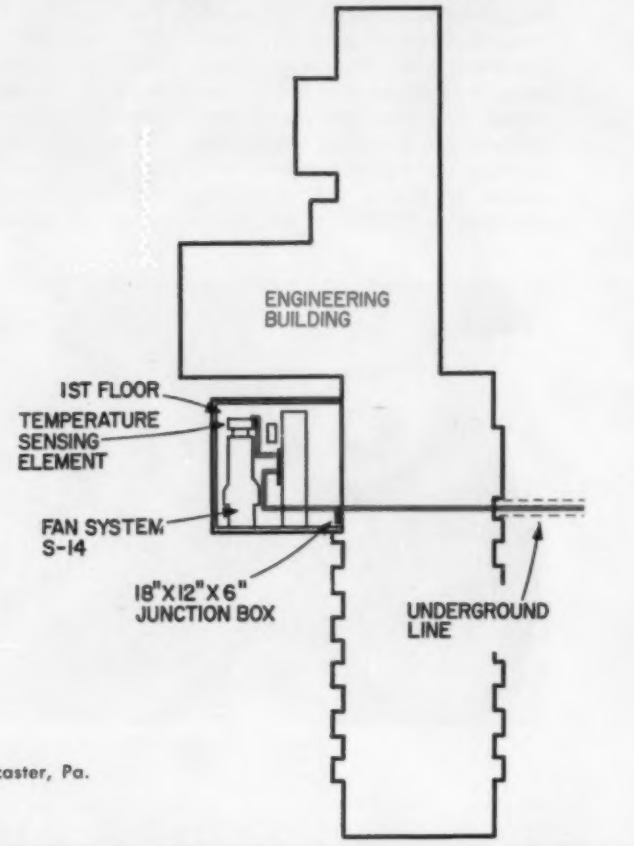
Fig. 2. Calibration instruments, as well as components being checked, must be kept at constant operating temperatures.

Fig. 3. Fluorescent lighting in ceiling and fluorescent lights over the work benches provide adequate, shadowless light.

CONTROL CENTER MONITORS AIR CONDITIONING

By **EUGENE D. SCRIBNER**, Project Engineer
Central Engineering Department, Armstrong Cork Co., Lancaster, Pa.

With three separate buildings spread over a large area, most of the air handling equipment had to be placed at remote locations. Colored lines show how the three buildings are tied into one control center.



MANY PEOPLE have the impression that once a central air conditioning system is installed, there is nothing left to do but enjoy its benefits.

Actually, even the most modern, up-to-date systems today require a full-time staff to operate, maintain and inspect the equipment, and investigate and handle complaints. The expense of maintaining such a staff often runs into considerable money, and, in some instances, can even boost total operating costs by as much as 100 per cent.

The Armstrong Cork Company recently found this problem particularly acute in working out the air conditioning plan for its home offices in Lancaster, Pennsylvania. The project, involving three separate buildings, was designed to incorporate all the latest advances in air conditioning technology. This included a relatively new means of diffusing air, using perforated acoustical tile ceilings manufactured by the company itself, in place of standard room air diffusers.

Since, however, the three buildings were spread out over a fairly large area, it was necessary to have 19 separate air distribution systems leading off the central cooling plant. This meant that much of the air handling equipment had to be placed at remote locations.

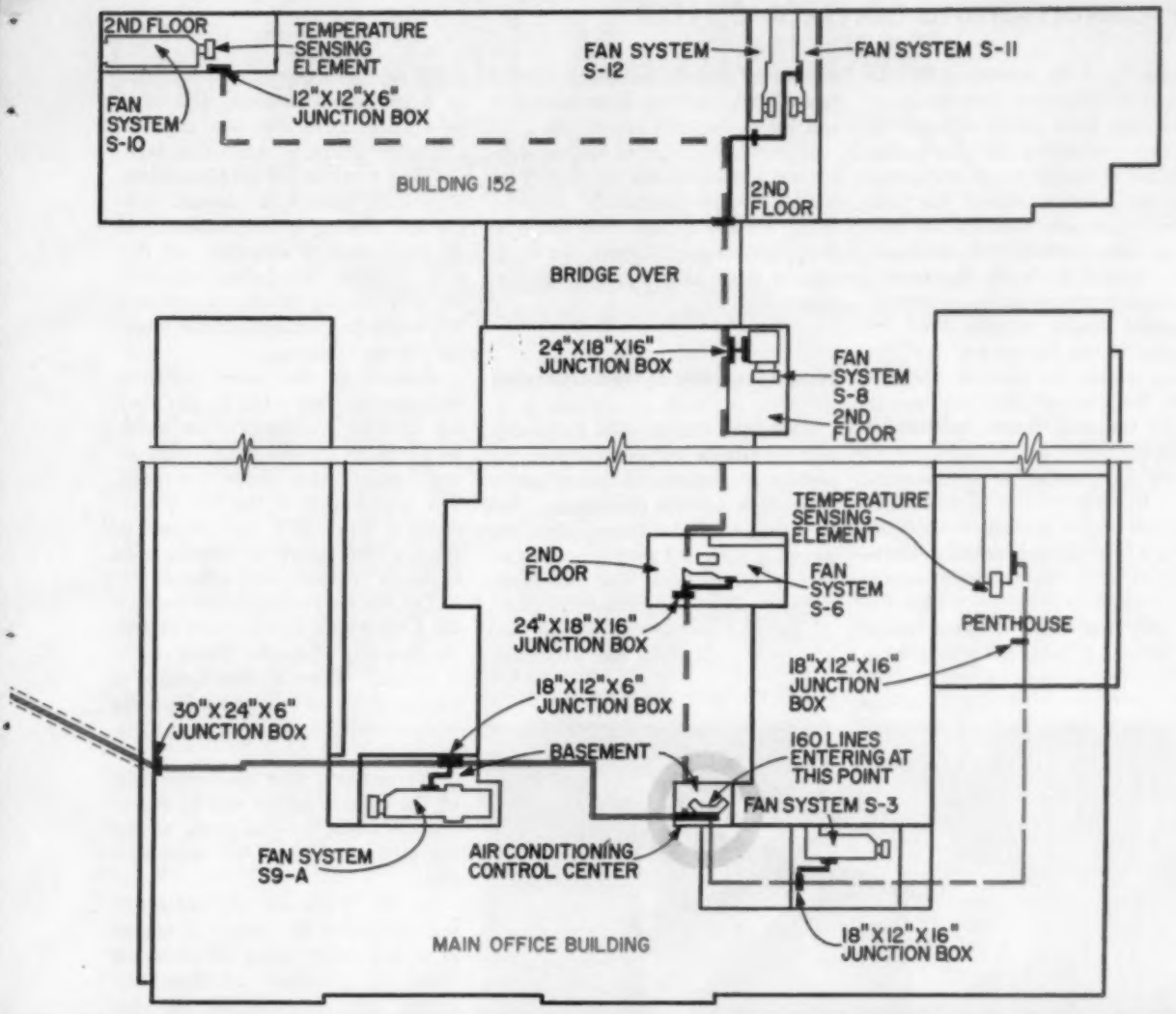
Because of this, Armstrong decided to install an air conditioning control center in its main office building. It would collect key operating data on the system at one convenient, central location, and also incorporate certain remote control devices to supervise the system's day-to-day operation.

Such a control device, it was believed, would permit closer and more efficient supervision of the air conditioning system, with consequent greater employee comfort. It also made it possible to cut the required full-time operating staff down to two men.

The control center, engineered and installed by the Johnson Service Company of Milwaukee, in conjunction with Charles S. Leopold, Inc., Philadelphia, operates entirely by a pneumatic transmission process, and provides a total of 323 different data checks and control facilities.

Temperatures at numerous remote locations in the central cooling and various air handling systems can be determined accurately at any time from the control panel, and can even be recorded for weeks on an automatic strip chart recorder.

If, for example, the temperature in a given room should ever exceed



normal limits, the operator can, at a glance, check the appropriate fan discharge temperature and ascertain immediately whether the trouble is at the central equipment or not. If the central fan should be at fault, this would save an unnecessary trip.

In addition, normal adjustments of the air conditioning equipment itself can be made from the control center as required. By means of a series of pushbuttons and selector switches, the operator can stop and start all spray water pumps, supply and relief fans, close or open the maximum and minimum outdoor dampers, and, when necessary, index

Right: Control panel checks 323 separate data and control facilities. Graphic insets on panel indicate locations of major components in air distribution and refrigeration systems.

Far Right: View of the dozens of pneumatic transmission lines which lead in from the various remote locations throughout the plant area.

all units from the summer to winter cycle of operation, or vice versa.

Although most useful in supervising and controlling the day-to-day operation of the air conditioning system, the control center has also proved extremely valuable in preventive maintenance. By instantaneously detecting faulty mechanical operation, it has, on several occasions, prevented serious trouble from developing in the equipment.

Last winter, for example, the dew point temperature gage for one of the air handling systems indicated a dangerous drop in the temperature of the air passing over the spray coils. Upon inspection, it was found that one of the outside air dampers had stuck in an open position, thereby allowing too much frigid outside air to enter the system. Had the difficulty not been detected early, the excessive cold air would have eventually caused the spray coils to freeze over, resulting in an expensive and time-consuming repair job.

A pneumatic type of control center was chosen largely because of its versatility and dependable performance. We also thought that this type was best suited to meet the company's particular control requirements.

How Pneumatic System Operates

Pneumatic transmission starts with the conversion of temperature, humidity, air pressure or other variables into a suitable pneumatic signal by a device called a transmitter. The signal is then fed into a ¼-in. OD copper transmission line run along the most direct and economical route. At the end of the transmission line a receiver converts the pneumatic signal into a movement of a dial, pen or a control mechanism, depending on whether the receiver is of the indicating, recording, or controlling type.

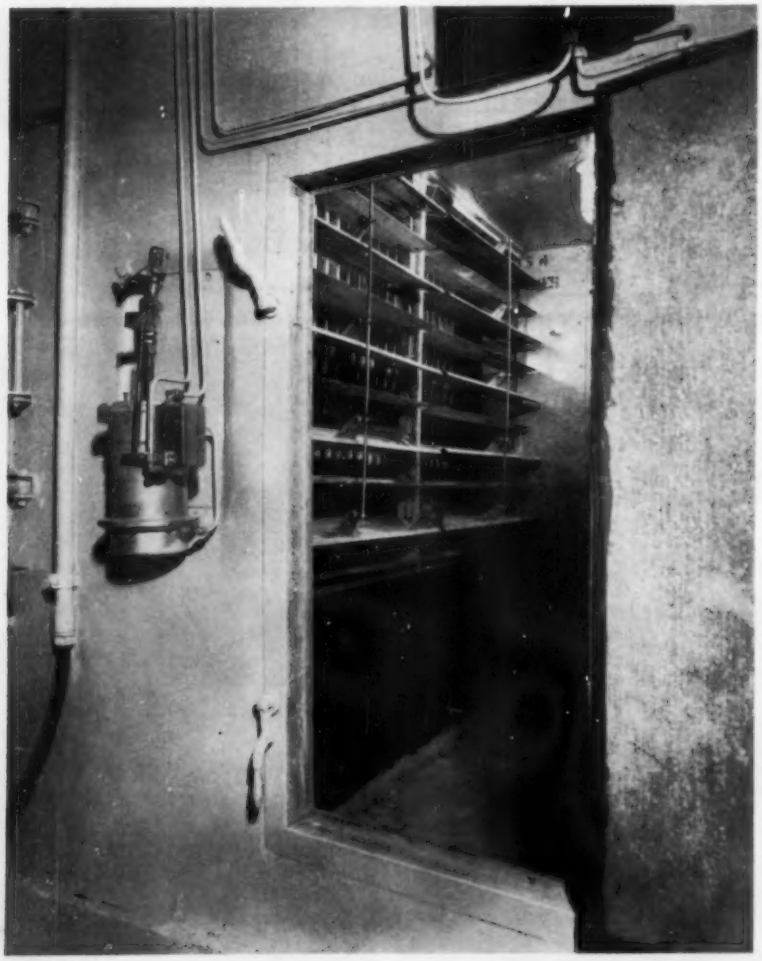
Compressed air for the instruments is partially dried by a standard cooling and filtering system consisting of an aftercooler, a separator and dirt and oil filters. We believe this cooling and filtering process is sufficient to protect the instruments from possible moisture damage.

Because of the many different transmission lines—160 in all—they are installed underground in multitube bundles encased in heavy plastic and buried about three feet deep. The temperature of the soil at that depth is about 50 F year around, so there is little danger of freezing even if the air contains some moisture.

The line runs underground between the Engineering Building and the Office Building where the control center is located. Where a third building is connected by an enclosed bridge, the transmission line is run through the bridge.

We estimate that the initial cost of the control center will be recovered in about 10 years, due to the cumulative savings in manpower costs.

In the meantime, the center all but eliminates the factors of human error and laxity which are often the cause of unforeseen additional expense. The company has the continual assurance that all components in the air conditioning system are operating at peak efficiency, and this not only contributes to greater employee comfort, but also insures against overly high power consumption and premature breakdowns of equipment. **End**



The air conditioning control center enables the operator to regulate damper positions without leaving the station. Selector switch on the control center panel sends pneumatic signal through a positioning relay to the damper control unit at left.

The Care and Maintenance of Scientists

Their physical surroundings—noise, dirt, color, location, dimensions and view—all affect these new prodigies of the industrial world. If you want them happy—use care

OVER MANY A plant engineer's desk hangs subtle warning—a kind of unseen placard which, were it visible, would read: "Scientists at Work: Handle With Care."

The warning—both verbal and psychological—more and more confronts plant men as their companies set up research and development labs, staffed by top-level scientists and engineers, many but recently lured from college campuses.

Top-level thinkers — though they may wear a company badge—are a breed apart. And industry—desperately dedicated to soothing its scientists lest they desert to competitors, as roughly 10 per cent of them do each year, or return to their campuses —must require that maintenance reslant its thinking (and even its planning and work schedules) where it pertains to plantdom's prodigies. Here are some examples of irritations that were heedlessly—and needlessly —produced.

• A western plant's maintenance chief recently cost a lab its top electronic genius. Reason: he decreed the color of the scientist's office walls, straightaway dispatched a painter to do the job—and so impinged the thinker's "freedom of choice" that, on the verge of leaving anyway, he did.

• Window washers — abiding to schedule more than to sense—barged into a "think" session recently at a Texas plant and, by top-management's estimate, "threw a rush project two days off pace."

• A time-clock, installed outside a door used both by top-level scientists and less lofty workers, set tempers aflare in an eastern lab—until management ordered it moved from sight.

• Cafeteria line-ups so vexed scientists in one plant that maintenance men were called in to revamp the single-line setup—and soothed both the trouble and tempers with "scramble service" (shorter, separate lines for service of entrees, salads, desserts and hot drinks). "Scramble service" removes the onus of regimentation—permits thinkers freedom of choice. And saves top-level time, besides.

Says a plant engineer in California, "Time was when you simply told a maintenance guy to go put in a new faucet . . . and be done with it. But now—what with thinkers using the lavatories—you plot every action, and then think twice before you install anything."

He refers to what, unsmilingly, he dubs the "Case of the Spring-Loaded Faucet"—a turn-off-by-itself hot water faucet in a men's lavatory. For years plant custom had decreed spring-loaded faucets on hot water outlets—to conserve boiler-warmed water. But to top scientists, so trivial a piece of plumbing loomed all out of proportion—a sign of company regimentation and undue pennypinching.

Outcome: the spring-loaded trouble-maker was yanked and replaced by the common household variety.

Or consider the 6-ft wide lab-office corridors that one enterprising plant engineer d e s i g n e d—and installed. The fact that corridor partitions boxed in walking space didn't jar the plant man's sensibilities . . . but it did the scientists'. They complained —avowing that such narrow corridors "cramped their thinking." And the job had to be redone—expanding corridor width (and presumably thinking) to 8 ft.

Are plantdom's prodigies unreasonable?

"Not at all," contends one psychologist, now turned specialist in designing what he tabs "creative environments" for top-level scientists.

"Most of these men," he avers, "are used to the academic life . . . to a place of thoughtful quiet, content-

Litton Industries' new Woodland, California, "think plant"—a kind of productive, campus-like retreat for the company's top-level thinkers.

Mall, with water pools and fountains, add restful effect to new Ramo-Wooldridge laboratory in Canoga Park.

CARE AND MAINTENANCE OF SCIENTISTS

ment . . . without time-clocks, schedules or regimentation. Plant noises grate on their nerves. Time-clocks rankle them. A janitor stirring through their experiments or papers can shatter them and maybe, a valuable project."

"The plain fact is," he continues, "these are not ordinary men. They're a breed apart from the production-liner. And smart management—and its maintenance staff—either come to appreciate and cater to this difference—or lose their top, and often irreplaceable, researchers to those who do."

Recently, for example, a western plant was on the verge of being awarded a multi-million dollar government contract. But the project's chief scientist, riled at a buildup of seemingly unimportant trivialities, departed for a rival company—and took with him, to his new bosses, the choice government plum. Uncle Sam's contract experts admitted that, without so talented an engineer, they simply didn't believe the old company could handle the job.

But let statistics speak for themselves: turnover rate of top-level researchers averages 10 per cent a year, as high as 20 per cent in aircraft, even a bit higher in electronics. More money is but seldom the reason for job-hopping. Most top-level men aren't money grabbers. Their status symbols are prestige and the admiration of their peers (other scientists, not the plant manager).

Quizzed why they left one plant or another, a surprisingly large number of them named grievances tied directly to plant engineering: (1) cramped, cubicle-like offices; (2) laboratory set-ups not conducive to creativity; (3) a host of irritations, ranging from bulletin-boards placarded with safety posters and beware-of-saboteur warnings (the latter caused a frenzy in one lab), to lack of air conditioning, too-high noise levels and poor lighting.

Maintenance staffers saw nothing wrong with green-painted, wallboard-thin partitions in the plant's old lab. Nor did 16-ft high ceilings or exposed piping seem the problem. Yet the plant had a problem: regardless of salary, it couldn't entice top-level brains into its corral. And without them, it was losing out on research . . . thus, its market.

Solution: a new lab—totally separated from the plant and its production line. Lab costs ran to $40 a square foot (three times the cost of the old plant's production facilities). But now the company has no trouble hiring scientists—and for a bit less money, in fact, than it had previously offered.

Not all plant managements, of course, agree that its prodigies should be pampered. Some contend that, given superior lab equipment, scientists will produce—creatively—under almost any external conditions.

But others—as top "think plant" engineers-architects, Los Angeles' Albert C. Martin and Associates—disagree.

Contends partner J. Edward Martin, "You've got to engineer a creative environment . . . for thinking."

The Albert C. Martin-designed Ramo-Wooldridge Laboratory, on 90 rolling acres in California's San Fernando Valley, is a good example of "built-in creativity."

Acoustical ceilings muffle noise.

Three open-air pools, their several score fountains gurgling midcenter of a plant-surrounded mall, soothe nerves—and put the plant's air-conditioning water to double use (the fountains spray-cool air conditioner water).

Direct sunlight and glare are eliminated by perforated shade screens placed at the edge of the roof's overhang.

Corridors don't come dead-on to solid walls—but rather open onto a vista of landscaped exterior . . . a thought-provoker which Martin engineers consider essential if you're to keep scientists happily creative.

But what of your plant . . . and, more specifically, what are some of the booby traps an engineering department can avoid in dealing with top-level scientists? More to the point, how can you improve or revise the facilities you now have? Here are a few proven tips:

Status Parking for Scientists. Status is important. If he's a "senior scientist," nameplate his reserved parking stall that way: "Reserved for Dr. A. A. Jones, Sr. Scientist." Physicists rankle at being confused with the plant physician.

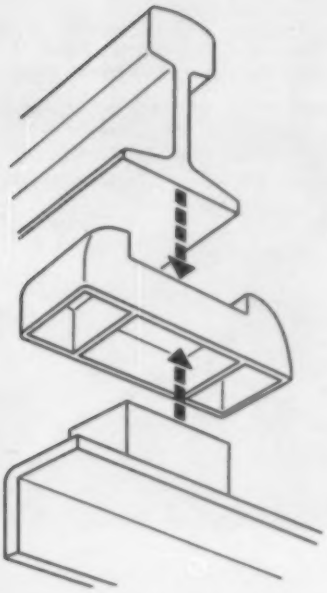
Supermarket Principle in Parking Layout. Many plants, treating their top-thinkers like supermarket customers, have widened top-level car stalls to 9 ft (the kind proven most parkable for store-shopping women). Reason: little irritations—as jockeying a wheel—at day's outset can trigger a mind to recalcitrance.

Office-Lab Color Harmony. Custom harmonies are the rule, rather than exception. But there are exceptions: top thinkers are almost always consulted on office colors, often pick their own. And with some

(Continued on page 240)

GLASS-PLASTIC CRANE RAIL SUPPORTS

They're good insulators, are mechanically strong and are easy to install . . .



Above: Hollow bottoms of the insulators permit them to slip over steel blocks welded to the ends of the steel struts projecting from main girder.

Left: This installation photo shows relationship of all parts in the system. The supports have been retouched in the photo to make them identifiable.

SPECIAL GLASS-reinforced plastic moldings are meeting Great Lakes Steel Corporation's need for crane power rail insulating supports that combine long-lasting insulating properties, excellent impact resistance and ease of installation. Plant engineering personnel at this division of National Steel Corporation expect the new insulators to last several times longer than the wooden supports they are replacing.

The new high impact strength insulators are molded from a special fiber glass reinforced polyester premix compound by The Glastic Corporation, Cleveland, Ohio. They are now being installed as replacements for wooden supports along the third rail conductors that power overhead cranes and a transfer car in the soaking pits at the company's present Detroit plant. There are approximately eight miles of such craneways at this location.

The insulators are also being installed as original equipment along the 1¼ miles of crane rail runway in the buildings of the 80-in. hot strip mill now under construction.

Capacities of the overhead cranes range from 10 tons to 300 tons. They operate on 250 volts d-c. Both 40 and 85 lb per yard third rails are in use, and the same basic insulator design, in two different sizes, is employed.

The insulators must provide adequate permanent insulation for the exposed conductor rails. They must resist carbon tracking that ultimately causes failure. They must withstand the abuse of constant crane vibration and accidental bumping. They must also bear up under strains caused by thermal expansion and contraction of long, continuous rail installations.

These fiber glass plastic insulators provide the required combination of properties, something that was not possible either with wood or with porcelain insulators, which had also been used. The plastic insulators have better electrical properties than wood, particularly under moist conditions. They have 6 to 8 times greater impact strength than porcelain.

With the plastic insulators, the required properties are obtained with a thin-wall, hollow construction. They can easily be slipped over steel blocks welded to the ends of the steel struts projecting from the main girder of the crane rail system. The third rail rests in the depression in the top of the insulators. The crane rails at Great Lakes Steel are anywhere from 15 to 80 feet above floor level, so ease of installation, a function of light weight, is a definite plus.

Porcelain insulators were first used. These were bolted to the steel angle, then filled with tar or pitch to insulate the tie bolt from the third rail. Replacement averaged 50 per cent per year, either because the insulator shattered or the tie bolt corroded.

Shattering was caused by the severe and continuous shock loads inherent in crane operation; although strong against loads, porcelain has a tendency to fail under shock load or impact. Corrosion of the tie bolt was caused by the inadequate protection afforded by the pitch fill.

Wooden fabrications made in the company's carpenter shop were next tried. They were of maple impregnated with paraffin and coated with Glyptal paint. They were essentially of the same form as the porcelain insulators that they replaced and also had to be bolted on. The bolt passed through the steel strut and into a hole in the wooden block. The top of the hole was then filled with pitch to insulate bolt from third rail.

Arcing from the third rail, which was aided by the contamination on the wood, caused conductive carbon tracking. This led to charring and in some cases destructive burning, with failure inevitable.

Replacement of the wood insulators averaged about 25 per cent per year. Changing insulators was a difficult operation at best for it was necessary to lift the rail several inches to permit removal of the steel bolt. The new insulator was then bolted on and the rail lowered back into position. **End**

Fig. 1. Room where aluminum products are anodized and plated. Floor is 3 ft below the heavy wooden platforms.

Fig. 2. Excess grit being removed after concrete was sandblasted. A clean surface assured permanent epoxy bond.

Two Years Old and Still Fighting Back . . .

How PLASTIC SHIELD PROTECTS PLATING ROOM FLOOR

By **RICHARD J. SMITH**
Resident Coordinating Engineer
Lockheed Missiles & Space Div.
Sunnyvale, California

TWO YEARS AGO an epoxy resin topping was applied to the concrete floor of the electroplating room in the Naval Weapons Industrial Reserve Plant at Lockheed. To date, this tough plastic covering is still intact, without corrosion, despite 16- to 20-hour daily exposure to solutions of hydrogen sulphite, hydrochloric and nitric acids, various chemicals and water.

This absolute protection of the concrete floor and elimination of all repair are what we had anticipated when the topping was applied in 1959. An epoxy was selected only after exhaustive study of many plating establishments in the California area, plus Lockheed's own search for an economical material which would resist corrosion for many years.

One particular test was indicative of the excellent resistance of epoxies to most acids and chemicals. It consisted of bonding four 4-sq in. wooden frames with an epoxy adhesive to a cured section of the epoxy topping. Into these squares were poured solutions of hydrosulphuric, sulphuric and nitric acids, as well as various alkalies and chemicals. The corrosive liquids remained on the topping for a minimum of 10 days. At the end of this time, examination revealed that none of the acids or chemicals had in any way affected the epoxy.

As a result of this test, other findings and published data, it was decided to surface the entire floor of the new plating room. The room is 60 ft wide by 140 ft long. The floor, which slants to the centrally-located drainage trench, consists of an 8-in. reinforced concrete slab. Around the plating area is a 6-in. high concrete curb.

The concrete was allowed to cure for at least two months. By this time, however, it was imperative that the plating tanks and other equipment be installed without further delay. The Kalman Floor Company, which formulated and applied the epoxy materials, was given approximately two weeks to prepare and top the 8400-sq ft area. The plating room floor was covered with a ¼-in.-thick topping at an average cost of $1.50 per sq ft for epoxy materials and labor.

Surface Preparation: A clean, dry surface being mandatory for a permanent epoxy bond, the entire concrete floor was sandblasted with a No. 1 grit until some aggregate was exposed. Although not used on this job, etching with dilute muriatic acid is another efficient method for cleaning concrete. After the grit was swept up, the floor was vacuumed thoroughly. This work was completed in five continuous days, the areas of coverage ranging up to 2500 sq ft daily.

Trench Protection: Before the epoxy topping was applied, the concrete drainage trench was sealed with an epoxy laminate. Glass fiber cloth was impregnated with a clear epoxy resin, (made by Shell Chemical) which cures at room temperature. The wet cloth then was draped in a continuous sheet on the bottom and up the walls of the trench, and was extended about three ft onto the floor on both sides. Later, the epoxy topping was brought to the edges of the

Fig. 3. To speed installation of plating facilities tanks were set in place on an epoxy topping which had been applied the day before.

Fig. 4. Water pours continuously onto the epoxy-topped floor and mixes with the various acids and chemicals beneath the tanks. For over two years the epoxy has withstood attack by these chemicals.

trench and three inches down the wall, covering the laminate. The combination of liner and topping eliminated the possibility of plating acids seeping beneath the topping.

Resin Mixing: One part of the epoxy topping, which was prepared by mixing modified resin with a curing agent, was added to a white sand. This mixture produced an epoxy mortar of extremely high viscosity. The curing agent sets up the chemical reaction with the resin to produce a tough, chemically resistant, solid plastic. The sand adds impact strength and also the body required for a trowelable mixture. Resin, curing agent, sand and a red oxide pigment were blended in an electrically-driven vertical mixer. The mixer holds a standard 5-gal bucket. Five pounds of the mixture covered approximately 8 sq ft to a uniform thickness of ¼ in.

Application: The plating room floor was topped with the epoxy in five consecutive working days by a crew consisting of separate mixers, carriers and spreaders. The latter set the pace.

Mixers prepared only enough of the epoxy mortar that could be applied without delay by the spreaders. The setting time of the mixed epoxy was about 1½ to 2 hours at 70 F but it will set much faster at higher temperatures and slower below 60 F. If the epoxy was not used within the limits of its pot (or workable) life, it would harden in the container. Another important factor was that mixed resin and curing agent had to be cleaned out of the container before fresh components were poured in, to prevent buildup of hardened resin.

To insure a thoroughly smooth surface without any joints which could allow seepage, steel bars ¼-in. thick and 10-ft long were used as movable screed lines. Lengths as much as 25 ft were covered at one time merely by sliding the bars as the work progressed.

After one 3-ft wide section was completed, a new epoxy strip was begun at the opposite end. The ¼-in. bars became one side of the screed, and the edge of the laid epoxy as the other. The next day, the fresh epoxy topping was butted against the partially cured plastic and bonded permanently to it to form a completely homogeneous covering.

The topping also was brought up the concrete curb to a height of 3 in. in a continuous sweep from the floor. In this way, there was no danger of seepage behind the curb area.

Curing: The epoxy topping is a room temperature curing compound which sets hard enough to walk on within 12 hours at 70 F and attains good strength in 2 to 3 days. These properties were put to a rigid test.

Application of the epoxy began on a Monday. By Tuesday morning, lift trucks were moving plating tanks onto the first section without any visible signs of material impairment. The same procedure was followed daily. Work on the floor was finished on a Friday.

By the following Monday practically all of the plating tanks had been set in place on the topping. This achievement is typical of the fast resurfacing attainable with the material, without the need for production slowdowns or stoppages.

Maintenance: The epoxy topping requires very little attention. It is inspected weekly, primarily to determine if any cracks have developed in and around the drainage system. As of January 1961, the topping shows no cracks, wear, corrosion or erosion. Once a week the entire plating room floor is flushed with plain water by means of spray bars located on the concrete curb.

This flushing does not remove the slight surface discoloration of the topping that collects around the tanks as a result of the evaporation of liquids from the acids and chemical solutions. However, this condition does not affect the topping, and is removed easily by brushing with stiff-bristled brooms.

There should be little doubt that this epoxy topping is capable of long-term protection of concrete floors in the most corrosive environments. The results have been so good that we plan to top the floor of a much older plating room. **End**

How Lighting Affects HEATING and AIR CONDITIONING

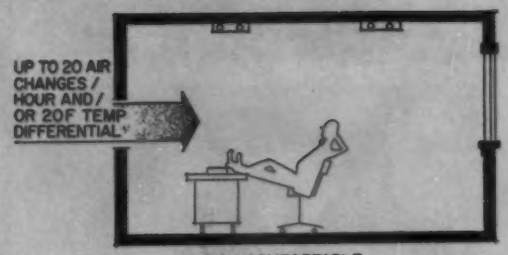


FIG. 1 COMFORTABLE

FIG. 2 DESIGN LIMITS EXCEEDED (DRAFTS, COLD SPOTS)

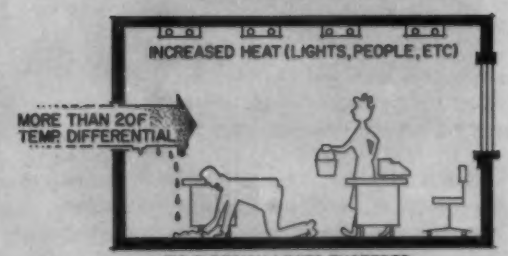


FIG. 3 DESIGN LIMITS EXCEEDED (CONDENSATION)

By **W. S. FISHER** and **J. E. FLYNN**, Product Planning and Application
Large Lamp Dept., General Electric Co., Cleveland, Ohio

Editor's Note—

Plant engineers are largely responsible for the design, installation and operation of service equipment in modern plant and office layouts. Lighting, heating and air conditioning are just three of the many different services required. As higher lighting levels currently recommended increase the heat from the lighting system, additional care must be exercised in the design and operation of heating, ventilating and air conditioning systems.

Coordinating or integrating lighting, heating, ventilating and air conditioning systems can provide comfortable office space with good over-all efficiency. Here are four reasons why you should read this article carefully:

1. In warm weather, a reduction of the lighting heat that enters a room improves occupant comfort and reduces air distribution requirements.
2. Use of waste air for fixture ventilation can prevent substantial quantities of heat from entering the cooling system. Initial and operating economies in air conditioning equipment result.
3. In cold weather, controlled distribution of lighting heat can improve heating system economy.
4. Ventilating fixtures provides near optimum temperature conditions for lamp operation. Lamp and ballast efficiency are improved.

ELECTRIC light sources, regardless of type, generate heat in relation to the number of watts consumed. However, the amount of light produced for a given wattage varies considerably, depending upon the type of lamp that is being used.

As the trend toward higher lighting levels has developed over the years, constant improvement in lamp efficiency, notably in that of the fluorescent lamp, has permitted increased illumination with little effect on room temperatures or comfort.

Now that the need for increased quantities of light is being generally accepted in industry, this situation is changing. Higher concentrations of electrical energy are inevitable in these areas, not only for lighting but for business machines and other equipment.

Somehow, the increased heat that results must be removed or neutralized before it can affect occupant comfort or reduce the efficiency of the mechanical and electrical parts of the systems serving the area. Furthermore, it is desirable to achieve this objective with minimum expenditures of energy, equipment and space.

Air flow, up to 20 air changes per hour and/or a 20 F temperature differential is accepted practice for a comfortable environment, Fig. 1. Increasing the air flow beyond 20 air changes per hour to get rid of heat causes drafts and cold spots in the occupied area, Fig. 2.

Introducing colder air will eventually cause moisture condensation on

Fig. 1. Air flow up to 20 air changes per hour and/or a 20 F temperature differential is goal for best comfort.

Fig. 2. Increasing air flow beyond 20 air changes per hour to get rid of heat causes drafts and cold spots in room.

Fig. 3. Cooling the air beyond a 20 F differential will eventually cause severe moisture condensation in ducts.

ducts and air diffusers, Fig. 3. This condition establishes the limit of approximately 20 F temperature difference between the cooled input air and the air in the room.

In relating air-conditioning limitations to lighting levels, it is apparent that conventional techniques can neutralize the heat from several hundred footcandles in addition to removing the heat generated by people and office machines, Fig. 4. Although this is considered a realistic appraisal for an interior office or room, it does not include an allowance for solar heat.

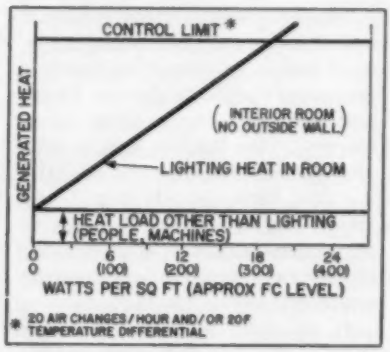

CONTROL LIMIT *
GENERATED HEAT
INTERIOR ROOM
(NO OUTSIDE WALL)
LIGHTING HEAT IN ROOM
HEAT LOAD OTHER THAN LIGHTING
(PEOPLE, MACHINES)
0 6 12 18 24
0 (100) (200) (300) (400)
WATTS PER SQ FT (APPROX FC LEVEL)
* 20 AIR CHANGES/HOUR AND/OR 20F TEMPERATURE DIFFERENTIAL

Fig. 4. Usual techniques can neutralize heat from several hundred footcandles of lighting for inside rooms.

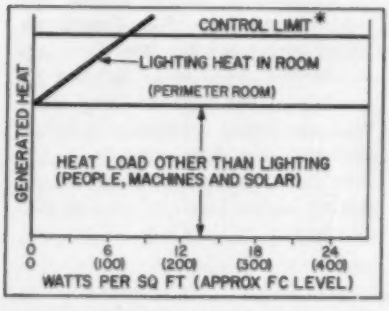

CONTROL LIMIT *
LIGHTING HEAT IN ROOM
(PERIMETER ROOM)
GENERATED HEAT
HEAT LOAD OTHER THAN LIGHTING
(PEOPLE, MACHINES AND SOLAR)
0 6 12 18 24
0 (100) (200) (300) (400)
WATTS PER SQ FT (APPROX FC LEVEL)

Fig. 5. Solar heat in perimeter rooms puts limit on lighting heat that can be removed within usual design limits.

With the current widespread use of extensive glass areas for exterior walls, the effects of solar heat substantially increase the load on the cooling system. This increased heat, like that from the lighting, must be neutralized within the limits of good design practice.

In some cases we have interior spaces where the heat from 200 to 300 fc is easily controlled with conventional cooling techniques, while in the perimeter rooms solar heat places an additional load on the cooling system. As a result, only a fraction of the heat in the room can be neutralized without exceeding the limitations of a conventional air-conditioning system, Fig. 5.

Because a lighted lamp is warmer than the surrounding air and warmer than the body surface of a human being, thermal gradients develop and a flow of heat results. Under extreme conditions, this heat can produce considerable discomfort for the individual, Fig. 6.

The body also loses heat to cooler windows and outside walls in winter, and to cooler air. This transfer of heat cools the skin and sometimes causes discomfort. A major objective of air conditioning design is to neutralize the thermal conditions in a room to prevent discomfort to the occupant from either excessive heating or cooling.

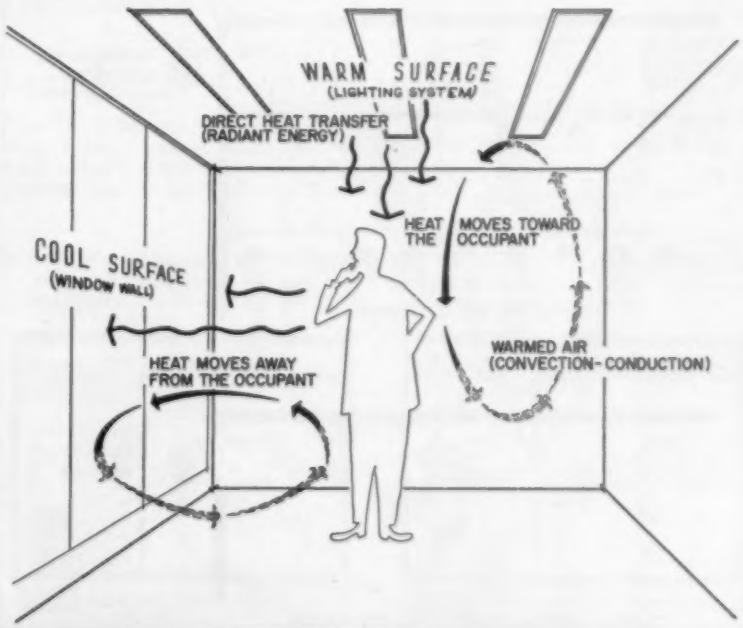
Essentially, heat transfer from a lighting system to cooler areas or objects takes place in two ways. Radiant heat follows the same path as light. It is short-wave infrared energy that passes through both glass and air with little absorption. When it strikes a person, surface or object it is absorbed or reflected, in much the same manner as light, and a sensation of temperature rise results because of the absorbed energy.

This type of heat is difficult to neutralize or eliminate by means of conventional air conditioning or air circulation methods. This is because the transfer of heat is directly between two objects or surfaces rather than to the surrounding air.

Control of this type of heat, then, depends upon techniques that reduce the temperature gradient between the two surfaces involved. This can be done, to some extent, by cooling the surfaces of lighting equipment or modifying the concentration of radiant energy.

A second type of heat transfer does respond to conventional air conditioning or air circulation methods. Conducted-convected heat is transferred from a hot object to the surrounding air by conduction. Warmer air then moves by gravity or convection to a cooler object where heat is again transferred by conduction. This movement of air warms objects, sur-

Fig. 6. Heat always flows from a warm object or surface to a cooler one. Lighting heat can cause considerable discomfort if not properly controlled.



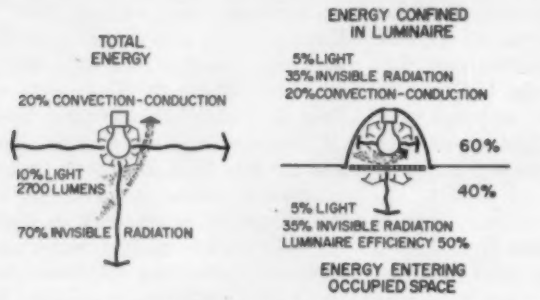


Fig. 7. Characteristic heat energy distribution for a bare 150-w incandescent lamp and same lamp in a luminaire.

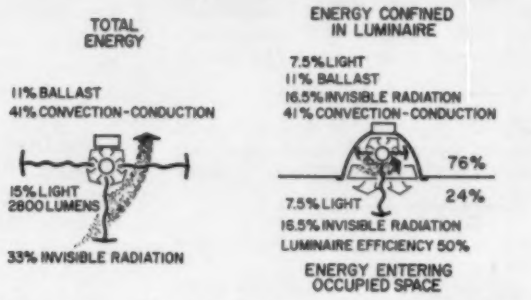


Fig. 8. Heat energy distribution of a 40-w fluorescent lamp and ballast having approximately equal light output.

LIGHTING AFFECTS HEATING, AIR CONDITIONING

faces and occupants within the room.

Because flow of air currents is the key factor in the transfer of this heat, the controlled flow of heated air is the objective of integrated systems. Modern systems are designed to keep this heat away from people in warm weather and utilize the heat more efficiently in cold weather.

There are fundamental differences in heat characteristics of incandescent and fluorescent lamps. The energy distribution for a bare 150-w incandescent lamp and this same lamp confined in a luminaire is shown in Fig. 7. Compare this with a 40-w fluorescent lamp and ballast having approximately equal light output, Fig. 8.

Remember that the fluorescent lamp has approximately three times the luminous efficiency of the incandescent lamp and therefore produces only about one-third as much heat per lumen. This difference in wattage accounts for a substantial difference in the amount of total heat produced.

Compare the total energy output of incandescent and fluorescent lamps, alone and in fixtures. Note that in a fluorescent luminaire, having 50 per cent efficiency, more than three-fourths of the lighting heat is initially trapped or absorbed by the lighting unit itself. If this heat is not removed or controlled, it moves by convection-conduction or re-radiation to adjacent ceiling surfaces or cavity and eventually enters the room.

If this heat is drawn off before it enters the room, it is easier and less expensive to maintain room comfort. Recirculated in cold weather, lighting heat can supplement or even replace the conventional heating system.

About one ton of cooling is required to remove the heat from approximately 3500 w of lighting regardless of the type of lamp used. With the initial advantage of better efficiency, the fluorescent lamp has been the most logical choice for obtaining higher levels of general illumination.

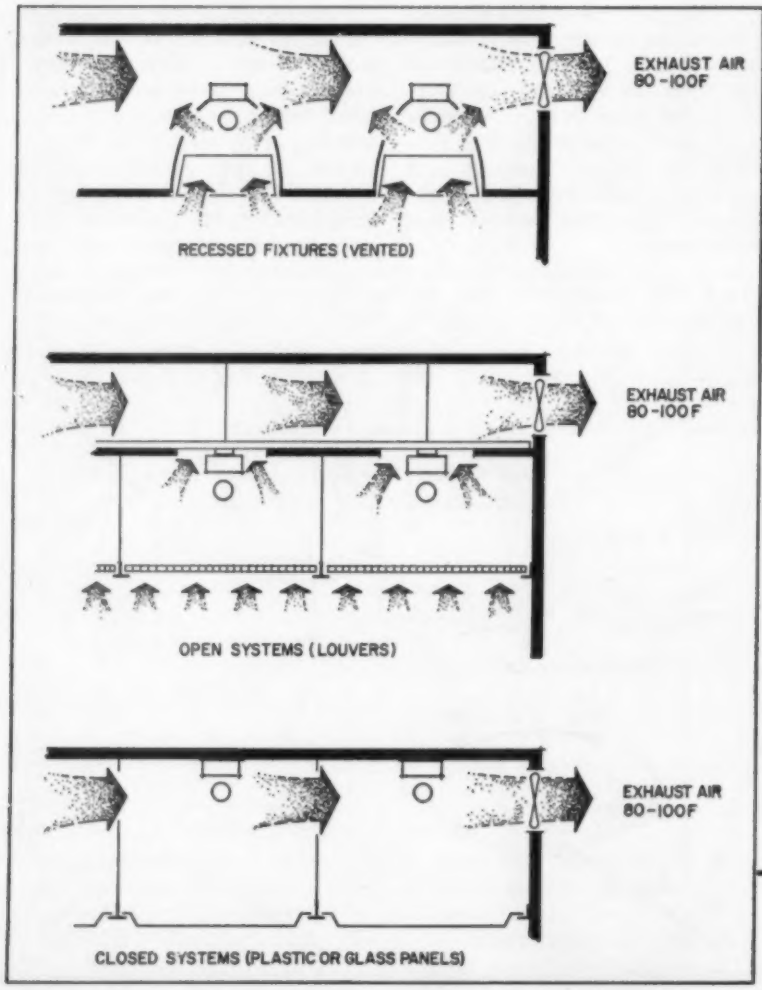
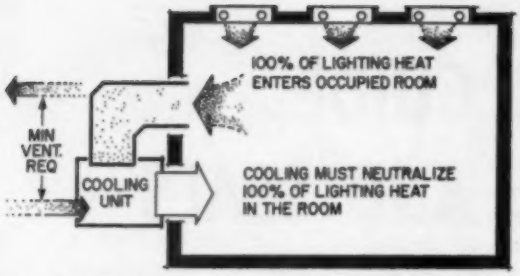


Fig. 9. Reduction of lighting heat in room permits increase in lighting without affecting occupant comfort.



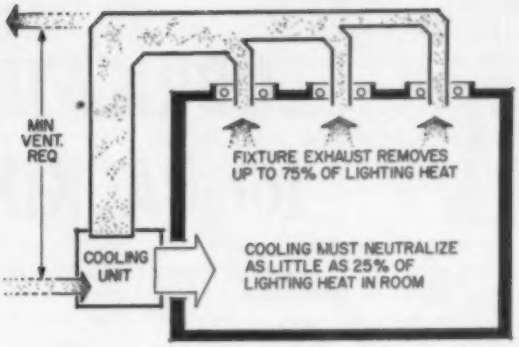


Fig. 10, above. In conventional system additional lighting heat adds to cooling load. Fig. 11, right. Removing lighting heat reduces room air conditioning requirements.

Use of ventilated lighting systems seems to offer potential advantages in reducing the heat in a room. In effect, this is one answer to the design limits of air conditioning systems that restrict air velocity and input air temperatures. As shown in Fig. 9, the reduction of lighting heat in the room permits an increase in lighting load without affecting occupant comfort.

Air from the room can be exhausted through the luminaires or cavity above the luminaires to draw off substantial quantities of heat. Because this heat is prevented from entering the occupied part of the room, this technique effectively reduces the requirements for maintaining comfort.

Although maintaining room comfort is certainly the initial purpose of air conditioning, the practical consideration of economics is no less real. It is obvious that additional lighting heat adds to the cooling load, Fig. 10.

Estimates based on conventional air conditioning practice indicate that in office areas, where about 100 fc of general illumination are provided, heat from the lighting accounts for approximately 35 per cent of the total cooling load. If the lighting level is increased to 200 fc, the resultant heat accounts for about 55 per cent of the total load.

Building codes specify the ventilation requirements for office areas. As a result, engineers design for approximately 25 cfm of fresh air for each occupant of a large office area. They assume an occupancy of one person for each 100 sq ft.

This quantity of fresh air introduced into the system requires the removal of an equal amount. Some of the waste air is exhausted through rest rooms and service areas. An additional small amount is used to maintain a slightly higher air pressure inside the building to reduce infiltration.

The air used for these purposes amounts to about one-third of the total waste air available. The remaining two-thirds can be put to use by exhausting it through the lighting system, removing part of the lighting heat in the process, Fig. 11.

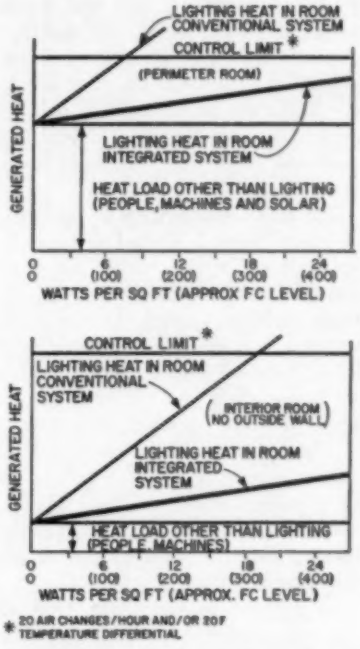


Fig. 12. Diagrams are the same as Figs. 4 and 5 except that a line has been added to show effect of reduced lighting heat within the room itself.

Because the replacement air is already accounted for as a normal ventilation requirement, an appreciable increase in lighting load is possible with no effect on cooling requirements. The diagrams, Fig. 12, are the same as Figs. 4 and 5 except that a line has been added to show the effect of reduced lighting heat in the room itself. Reducing the quantity of heat in the room reduces the demand on the air distribution system. With integrated systems, lighting levels can be increased considerably without pushing cooling-system operation beyond limits of comfort and efficiency.

Ventilated lighting systems remove heated air from around the lamps, improving lamp efficiency. For example, a T-12 fluorescent lamp operated at 430 ma in motionless air and a 100 F ambient, produces about 12 per cent less light than the same lamp at 77 F.

Many lighting systems produce ambient temperatures of 80 to 100 F or higher. Therefore, it is desirable to

(Continued on page 236)

Fig. 13. Heat pump size is determined by winter heating load. Winter conditions call for a 70 to 75 F gradient.

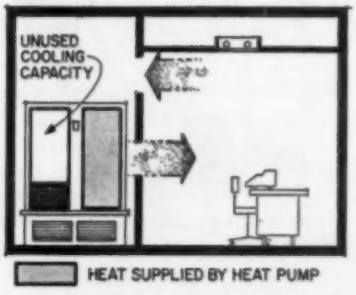
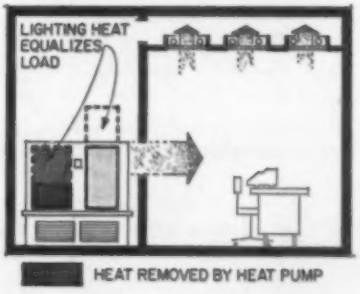


Fig. 14. Controlled heat from lighting system adds heat in winter reducing heat pump size, improves efficiency.



LUBRICATION GUIDE for PACKINGS AND SEALS

By R. W. FISHER, Coordinator of Technical Engineering Service, Garlock, Inc., Palmyra, N. Y.

THE PREVENTION of fluid leakage between relatively moving surfaces calls for a close conforming device described as a packing or seal which may be defined as follows:

1. A dynamic packing is a non-automatic or adjustable item installed in a stuffing box and adjusted by a gland to the desired shaft fit. Such items are often called jamb packings.

2. A dynamic seal is an automatic or non-adjustable item installed in a predetermined space.

Packings, whether adjustable or non-adjustable, usually function under fluid pressure. This fact demands close conformity with the moving surfaces and the ability to carry this pressure which is the equivalent of a bearing load.

Thus packings are, in a sense, unique bearings — unique because every effort is made to eliminate an oil wedge between the surfaces, and to maintain so-called "contact" with the shaft around its entire periphery. No true contact is established, of course, since a lubricating film is necessary for the operation of any dynamic packing.

Without the film, excessive heat would be produced, and the result would be wear, scoring, and destruction of both the packing and its journal, the shaft. On the other hand, the film must be exceedingly thin to prevent it from flowing through the clearance to produce excessive leakage.

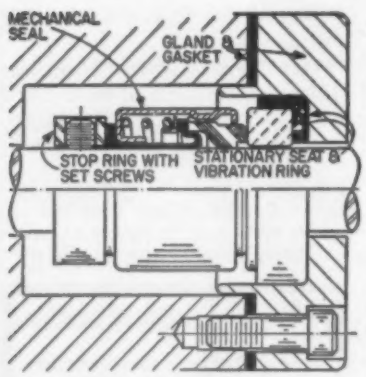
The first consideration of packings discussed below is limited to dynamic applications of the broad range of non-automatic devices—that is, to jamb packings as they are employed between two relatively moving surfaces. Included among these packings are braids, duck and rubber coils and rings, jacketed packings, and certain of the plastics—bulk mixtures of various fibers; solid lubricants such as graphite, mica, or Molysulfide; and bits of soft metals commonly bonded together with grease or an elastomeric binder.

In braided packings, the type of lubricant employed varies with the specific function of the braid. For cold water service, a waterproof grease must be supplied; for work against solvents, castor oil, soap or hydrogenated fish oil may be used.

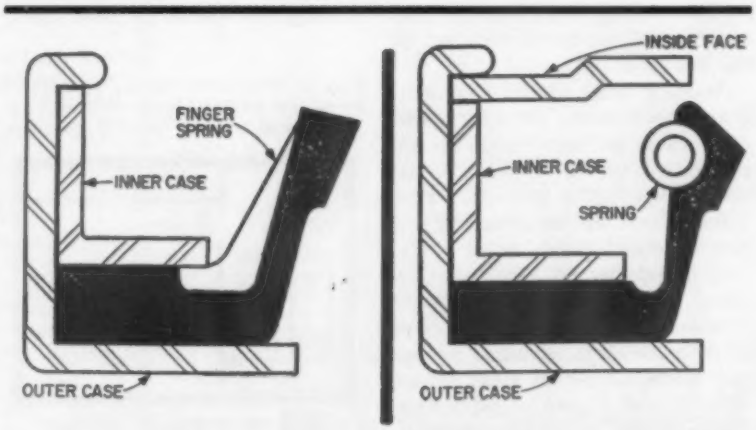
Duck and rubber rings are normally impregnated with a mineral oil, but occasionally must depend upon water which they attract in service. For plastic packings the oil or grease in the binder usually provides the initial lubrication, and there is also a high percentage of graphite or similar material which functions as a dry lubricant. Some of the plastic packings contain bits of soft metal, such as babbitt, resiliently supported in the mix. The metals are in themselves excellent bearings; combined with the plastic, they provide superior service.

In automatic packings, such as molded V, U, and O-rings, flanges, and cups, the fluids being handled act as lubricants. Since these packings are automatic, they squeeze the shaft more tightly as the pressure increases. The film is thus thinned and the probability of leakage is decreased.

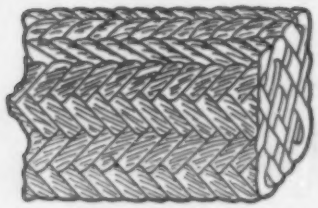
The lubricant is drawn by the shaft under the packing by the reciprocating action of the rod or piston. (While



An efficient packing, the mechanical seal, is recommended for rotary work.

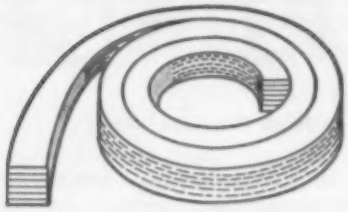


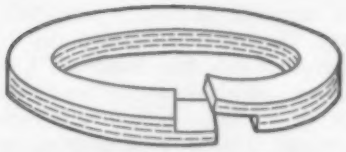
Oil seal sections show how springs maintain lip contact with shaft.



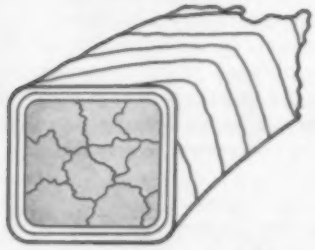
LATTICE BRAID

Braided packing. Lattice weave of the material increases its durability.





Spiral packings are generally recommended for reciprocating service.



Asbestos core with metal foil is used in rotary or mild reciprocating work.

automatic packings are not generally used with rotating shafts, partly because there is no feasible method of drawing the fluid under, they are sometimes employed on slow speed, low pressure jobs).

Because of this condition, lubrication engineers have attempted to determine the ideal shaft surface. Under normal conditions, a surface finish of between 16 and 32 rms has been found most practical. This degree of roughness produces excellent pockets to carry the lubricating liquid under the packing with a minimum cutting or wear.

With high pressures, a finer finish (approximately 8 rms) is considered necessary, and in extreme conditions a finish of 4 rms is used. These recommended surface finishes may vary slightly with the lubricity of the liquid, its ability to wet the shaft and the type of packing.

Metal packings, in the form of floating segmental rings held in initial sealing relationship with the rod or cylinder by a spring, are also in this category. They require that the lubricant be drawn under the rings by the reciprocating rod. Where such lubricant is not present in the gas being handled (this packing is normally for high pressure gases or steam) lubrication must be provided from external sources.

"Dry" Bearing Materials

Recently some good results have been achieved on dry gases, where the temperatures are low without external lubrication, by using "dry" bearing materials such as special mixtures of Teflon. Such mixtures are usually referred to as "filled" Teflon and consist of minute glass fibers or carbon-graphite filling in a matrix of Teflon.

The oil seal, a lip type packing, is designed for non-pressure service; however, it does respond to act automatically under pressure. Since it operates on a very narrow wear band, any fluid loading must be kept very low to avoid excessive unit loading on the wear band which would burn up the seal.

Under seal design conditions of no pressure, it cannot be automatic. However, such action is achieved by building in a spring-loading device. A finger or coil spring is provided around the lip thus forcing it inwardly against the shaft. The loads used are low, normally ranging from ¼ to ¾ lb per linear inch of circumference. High pressure-velocity ratios are not satisfactory in oil seals.

Another method of introducing the lubricant employs the oil cup, and depends upon the lantern, an annular ring having a spool or H-shaped cross section. The lantern ring which is associated with a lubrication connection through the stuffing box wall, may be machined from a short metal cylinder with clearances adequate to fit within the stuffing box and around the shaft.

The mid-section of the cylinder is provided with annular grooves (one each on the I. D. and O. D.), which are interconnected by a series of holes through the remaining web. A lubricant, introduced through the side wall of the stuffing box, fills the voids in the lantern, thus reaching the shaft and packing.

The stuffing box lantern ring serves not only as a means of introducing the lubricant, but also as a reservoir for it, and may be fed by a grease cup, by a drip oiler, or by oil under pressure. A positive means, such as the latter, is much preferred to the grease cup or grease gun fitting, which supplies only intermittent servicing.

An oil bottle may also be used to good effect in keeping the oil under pressure. The bottle is energized by pressure from the discharge side of the pump; and since the shaft is on the inlet side, the discharge pressure creates an adequate differential.

Another applicable device is the differential cylinder, used chiefly when it is desirable to maintain the pressure in the lantern at a slightly higher level than in the medium being packed. The differential pressures involved are not great, generally ranging from five to ten pounds.

Finally, it is possible to employ a completely independent lubricating system, which may operate either continuously or intermittently.

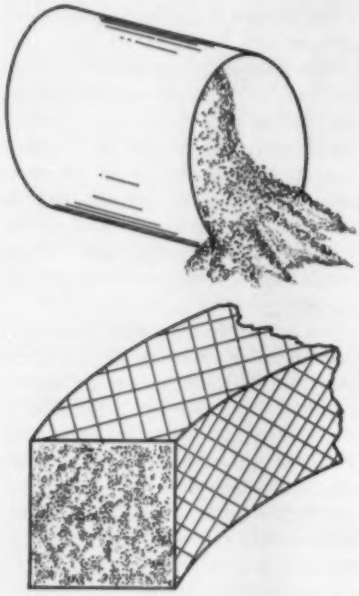
Lantern Ring Also Cools

Besides serving as a means of introducing the lubricant and as a reservoir for it, the lantern ring also performs another function: cooling. By locating an outlet equipped with a bypass valve on the opposite side of the stuffing box, it is possible to adjust a constant flow of the lubricating agent to the packing and around the journal, thereby removing a high percentage of the heat generated inside.

The thin film which lubricates a packing is also used as a sealing agent. Since it is generally introduced at a pressure several pounds higher than the fluid being handled, comingling is expected. For this reason the two substances must be compatible.

In packing mayonnaise, for example, Pure Food regulations must be observed: vegetable or cotton seed oil is often used as the lubricating agent. Other examples are more ob-

LUBRICATION GUIDE FOR PACKINGS AND SEALS



In plastic packings, oil or grease in the binder provides initial lubrication.

vious: one would not use glycerine in the lantern ring or seal ring of a pump that was pumping nitric acid —nitroglycerine would be formed. The object, in all cases, is to assure compatibility while maintaining the greatest possible lubricity.

Adjusting a set of soft (non-automatic) packings, should be accomplished by tightening the gland stud by not more than one flat of a hex nut at a time, after which the packing should be allowed to run uninterrupted for 10 or 15 minutes. Any attempt to eliminate leakage completely is almost certain to result in a burned-up set of packing, often in a few minutes' time.

In cases where the set is in good condition and still contains adequate lubricant, the lubricant acts as a safety valve. However, if the packing is over-tightened, friction becomes excessive, heat is produced and the set tries to expand, as a result the lubricant becomes thinner and more mobile and is squeezed out, thus the volume of the set decreases and equilibrium is reached. However, should there be insufficient lubricant remaining, the result may be a cloud of smoke, destroyed packing and a scored journal.

Automatic packings should not require adjustment. Cups, U's, O-rings, V-packings and flanges, have a predetermined depth of the stuffing box or axial space between the retaining surfaces.

In replacing a packing, cleanliness is the major factor to be considered. Rings should be carefully slipped into place with joints of soft packings staggered. They should be positioned true and square and free of all foreign matter. A split wooden block or cylinder that one can slide into the box can be used to tamp the packing in place uniformly. After the stuffing box has been filled, it should be tightened up snugly, then backed off to allow the packing to expand.

In this manner, provision is made for a certain "looseness," so that the pump can be started up without danger of overheating or damaging the packing or journal in any way. The shaft and especially the piston and the rings supporting it must also be checked to insure that it is true and properly supported.

For High Pressure Work . . .

In high-pressure work, precautions concerning clearance must be observed, since failures in the operation of automatic packings, cups, O-rings, and V's are most often caused by extrusion into the clearances. Elastomeric materials, whether used alone or as a binder in a fibrous packing, are deformable. Even with recommended fine clearances, the O-ring requires special back-up or anti-extrusion rings above 1500 psi.

Under several thousand pounds of pressure, very fine clearances, on the order of one or two thousandths, are required. If such close tolerances are not practicable (as is usually the case), a strong back-up ring is con-

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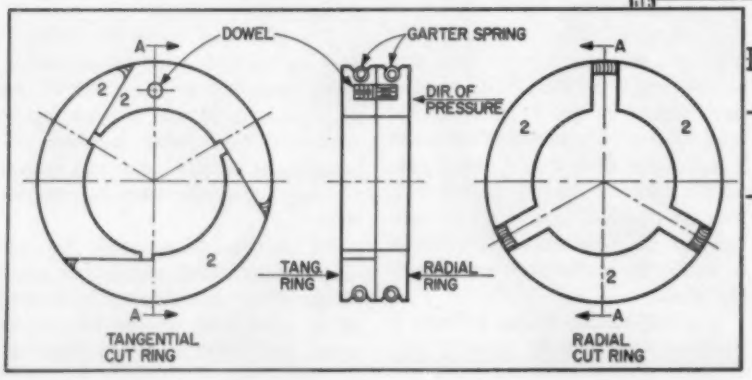
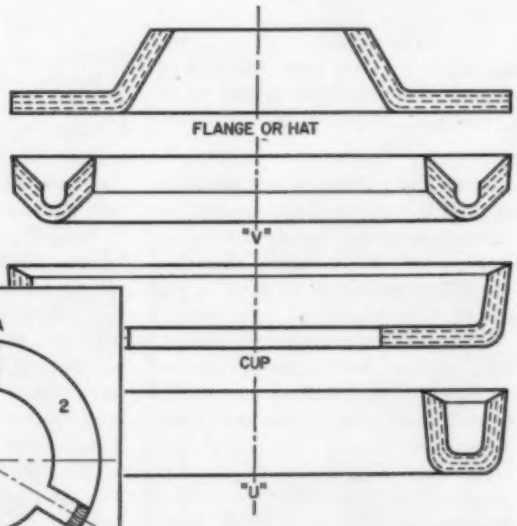
Below: Metal packing rings are used almost exclusively for high pressure reciprocating work involving gases.





Above: Sections show various packing shapes to fit machine contours.

AIR POWER PROPELS TRANSFER CAR BETWEEN FURNACES

By D. P. **BRAUTIGAM**,
Plant Engineer,
West Michigan Steel Foundry Co.,
Muskegon, Michigan

REARRANGEMENT and modernization of casting cleaning facilities necessitated the development by the plant engineering department of an economical handling system. The system removes red-hot steel castings at 1650 F from any of three car-type furnaces and transports them to any one of three cooling sheds located opposite the furnaces.

A number of remotely-powered cable and chain-driven pull-car systems were considered. However, none of these systems would do the job adequately due to poor resistance to heat, lack of flexibility or excessive cost.

The decision to use three compressed air-powered motors to drive the various components of a unique reach-lift type transfer car was made by the plant engineering section, while working jointly on the problem with a crane engineering firm. An air motor system, properly shielded from heat radiation, was expected to give the control required for smooth operation of all car movements.

Operations of the car are controlled by an individual in a heat-shielded

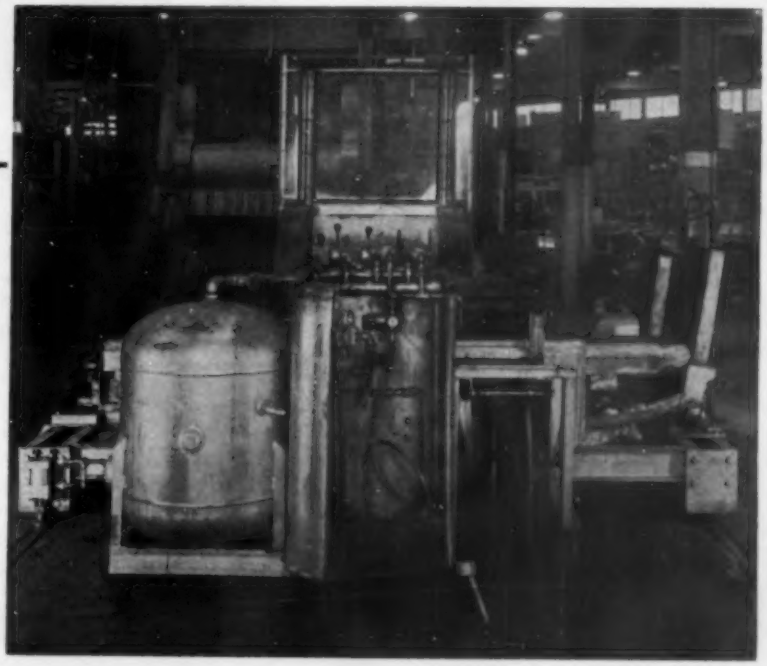


Fig. 1. Right: All air-actuated components are controlled by operator through a manifold of rotary valves located in heat-shielded cab. Compressed air at 90 psi is supplied to a receiver tank mounted on the car.

Fig. 2. Top Right: View of the front end of transfer car which is used to reach into 1650 F annealing furnace to pick up racks of red-hot castings and deliver them to cooling sheds.

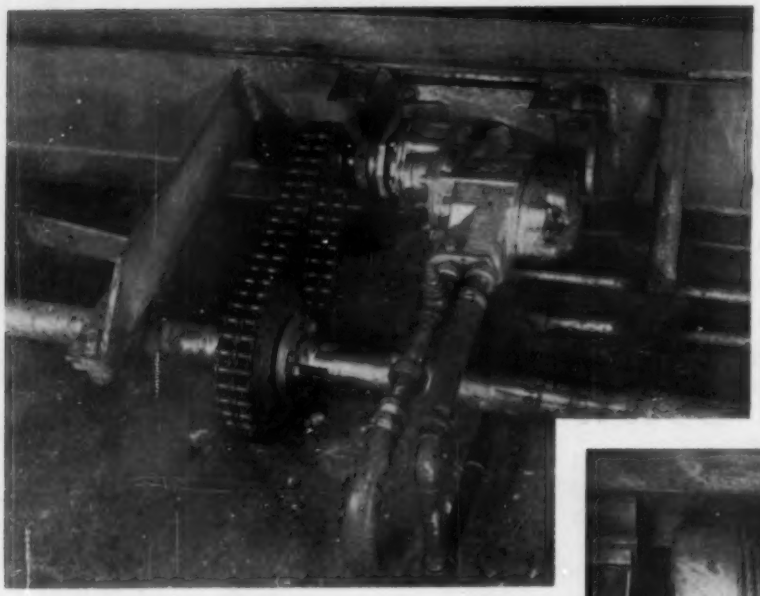
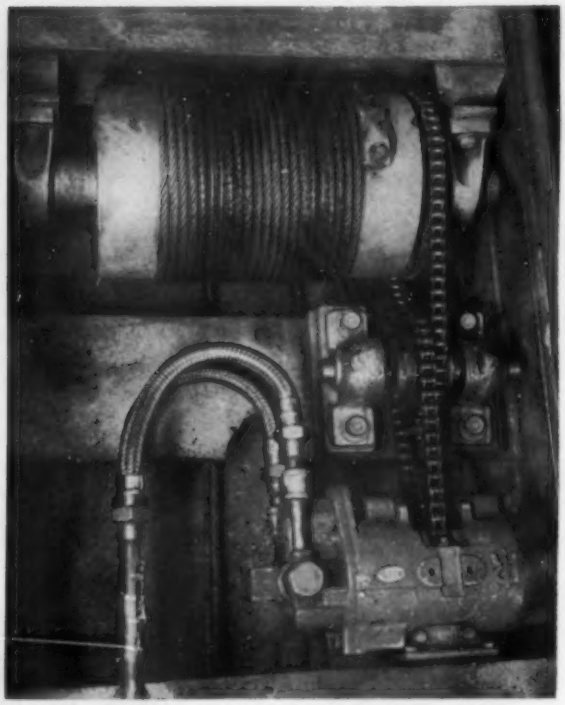


Fig. 3. Left: Car is propelled along tracks by drill-motor driving axle through roller chains and sprockets.

Fig. 4. Below: Two reach-lift arms are driven into furnace at right angles to main rails by 1000 lb capacity roller chain air hoist through a double speed reduction of roller chain, sprockets, and the cable and drum arrangement.



AIR POWERED TRANSFER CAR

cab through a manifold of rotary valves. Compressed air at 90 psi shop pressure is supplied through a ¾-in. diameter reeled hose to a 10-cu ft capacity receiver tank mounted on the car. The reel pays the hose out and picks it up as the car travels along the track, thus eliminating wear on the hose that is usually caused by dragging it along the floor.

The receiver tank is mounted on the car to correct pressure drop in the system, and to trap moisture which is drained at the bottom of the tank. The receiver was designed to supply compressed air at a minimum of 70 psi to all three motors running simultaneously. A lubricator and strainer were installed between the receiver and the control valve manifold.

Transfer car is propelled along the tracks between the furnaces and cooling sheds by a 3.5-hp drill-motor driving an axle through roller chains and sprockets. A four-inch diameter air cylinder with a two-inch stroke forces a pad against the rail and acts as a brake to hold the car in position in front of the anneal furnaces and cooling sheds.

Two reach-lift arms are driven into the furnaces on stainless steel tracks at right angles to the main rails by a 1000 lb capacity air hoist motor using a double speed reduction of roller chain, sprockets and cable drum.

The 12,000 lb load of hot castings is lifted from piers in the furnace by eight hydraulic cylinders that are actuated by an hydraulic piston pump which is direct-driven by a vane type air motor.

Regular 220 SUS oil is used in the hydraulic cylinder system. Fire is not a serious problem because excessive leakage is limited by five rings of high temperature chevron-type packing on each single-acting piston, and all components of the hydraulic system are shielded from the radiant heat of the furnace and castings. The small quantity of oil that does leak onto the tracks in the furnaces flashes immediately and adds no appreciable heat to the furnace or car.

The loaded reach-lift arms are retracted from the furnace onto the car by the hoist motor. The air brake is released and the car is propelled along the track by the drill motor, to a cooling shed. The car is aligned, the brake is set, and the hoist motor drives the reach-lift arms and load into the cooling shed. The operator releases the hydraulic pressure in the lift cylinder and sets the load on pedestals in the cooling shed.

This system has proven extremely effective in providing adequate power, resisting heat and allowing smooth control of movements at a reasonable cost. **End**

An Evaluation of GROUNDED NEUTRAL POWER SYSTEMS

By **JOHN G. HOWELL**, Electrical Engineer, Owens-Illinois
General Engineering Dept., Pacific Coast Div., Oakland, California

DURING THE past decade an increasing use has been made by industrial plants of grounded neutral, four-wire, wye connected systems for the distribution of power. There are two basic advantages to grounded neutral systems: (1) the line to ground voltage surges caused by arcing faults are prevented from rising to values that can damage insulation, and (2) ground faults can be more readily located and cleared in grounded neutral systems.

There is a further advantage in the case of 277/480-v systems in that the 277 v from line to a solidly grounded neutral permits operating large scale lighting systems directly from the power distribution system without additional transformers.

The advantages of grounded neutral systems over ungrounded systems seemed so substantial that in the last six years we have made use of grounded neutral systems in various forms in three of the Pacific Coast Division's plants of Owens-Illinois. These installations are as follows:

Two plants have 277/480-v systems for low level power distribution. Each of these plants also has a 2400/4160-v system. All of these systems are solidly grounded except for one of the 2400/4160-v systems which is resistance grounded and provided with a ground relay and reactor to trip the feeder circuit breaker in case of ground fault.

The third plant has a 1380/2400-v system with resistance grounding and a ground fault alarm panel.

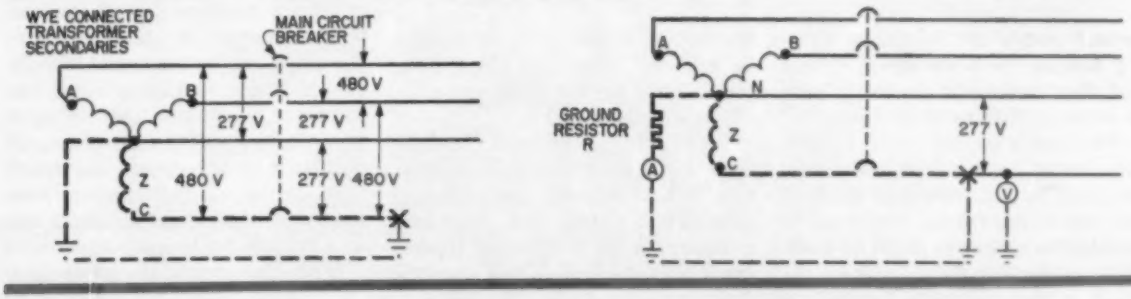
Since these grounded systems have now been in operation for three years or more, it is pertinent, therefore, that we look at the results obtained as compared to the ungrounded delta systems in use at our other plants on the Pacific Coast.

Briefly, our conclusions are that we were well advised to use the grounded neutral systems, particularly for the 2400 and 4160-v systems. For the 277/480-v systems, however, we now feel that it would have been more advantageous for these particular installations to have used resistance grounding and foregone the feature of serving lighting loads directly from the system. A brief analysis of each of these systems follows.

First let us consider the 277/480-v systems with solidly grounded neutrals. This type of system was selected with considerable enthusiasm for the two plants which had demands of 800 and 1400 kw, primarily for the reasons already noted. We also hoped that, among other things, we could operate all of the high bay

Fig. 1. Solid Grounding (3-phase, 4-wire 277/480 v): Fault X to ground causes short circuit current (— —) to flow. With solid grounding and low impedance of conductors; short circuit current (SC_A) = 277/Z, where Z is impedance of transformer. For 300 kva, Z is approximately 0.02 ohms. Thus, short circuit current may rise to 15,000 amps before circuit breaker trips.

Fig. 2. Resistance Grounding (3-phase, 4-wire 277/480 v): The fault current is limited by the resistance of the ground resistor which is large compared to Z. For five amp maximum R = 277/5 = 55 ohms. Continuous capacity of resistor = $I^2R = 5^2 \times 55 = 1275$ watts. (This system preferred if no importance is attached to energizing fluorescent and mercury vapor lighting from it.)



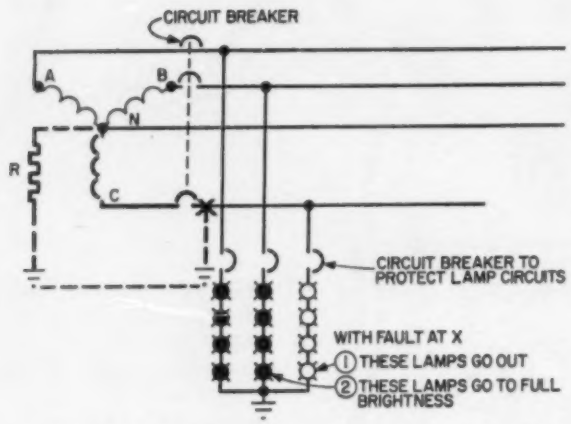


Fig. 3. Use of four 120-v lamps for ground detection: The presence of a ground fault may be indicated by (1) an ammeter (A) in ground resistor circuit (Fig. 2); (2) a voltmeter (V) line to ground (Fig. 2); or (3) banks of ground lamps, above.

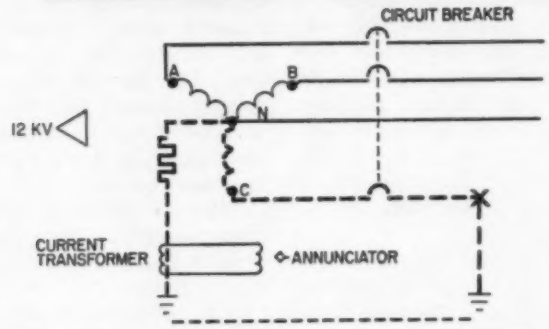


Fig. 4. Diagram of alarm system for 1380/2400-v system.

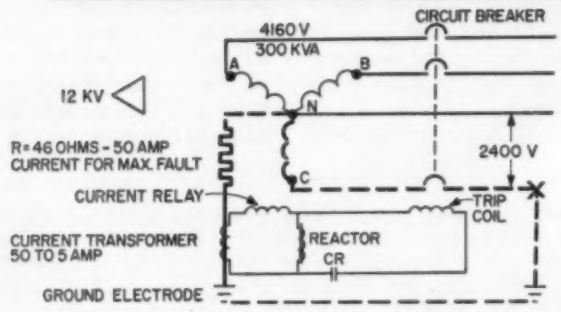


Fig. 5. Diagram of tripping circuit for 2400/4160-v system.

mercury vapor and fluorescent lighting directly from the power system and thus make appreciable savings in wiring and transformer costs.

However, when the actual lighting installation designs were completed, we found that no more than about 10 per cent of the lighting seemed to be suitable for serving at the 277-v level. This was because the lighting for the warehouses worked out better with incandescent lamps and the fluorescent lighting for the offices was actually less costly at 120 v.

We also found that with our processes, it was sometimes quite undesirable to have a motor suddenly stop because of a ground fault, since such a failure in an interlocked process can bring the operation to a standstill until the fault is corrected. Whereas, with our older delta systems, the operations were seldom, if ever, interrupted by a single ground fault and there was always a good probability of continuing the operation even with a second ground. Thus, while a four-wire grounded neutral system may pinpoint the ground fault, the resulting interruption of the operations can be—and was in certain cases—the more aggravating condition.

Looking back, I believe that we would have arrived at a more satisfactory installation if we had not tried to serve at least some lighting from the 277/480-v system and had instead operated the system with resistance grounding. That way if a ground fault occurred, no more than about three to five amps could flow through the fault and into the ground loop.

With the system grounded to neutral only through resistance, ground detector lamps or relays may be used to indicate when there is a ground, yet there will be no interruption of interlocked operation unless there is a second ground and on another phase. Nevertheless, with resistance grounding as well as with solidly grounded systems, voltage surges due to arcing faults may still be prevented from reaching the high values that can occur in a completely ungrounded system.

A circuit which has gone to ground should not normally open by action of the overload protective devices with a resistance grounding; yet with such a system it is still possible to locate the grounded circuit relatively easy without necessarily opening each circuit to see which one is grounded. In some cases the tests can be made with a tong tester to measure simultaneously the "net current" in all three legs of each feeder that is suspect. Or if the feeder cables are too large for all three to be encompassed by the tong tester, the cables can be measured individually and any unbalance noted. If there was no ground fault during a previous test, the amount of normal unbalance in any circuit was noted, then the job of distinguishing from normal unbalance and unbalance due to a ground can be made easier.

With the grounded circuit thus

identified, it should be a simple matter to locate the fault for correction as operating conditions permit. Figure 1 shows a typical solidly grounded neutral 277/480-v system under conditions of a ground fault. Figure 2 shows the same system with resistance grounding and how the ground fault current may be limited to a permissible continuous value. Figures 3 and 4 also show how a ground fault condition may be detected with resistance grounding.

The plant with the 1380/2400-v 4-wire, resistance grounded system was originally designed with a 2400-v delta system. This system was abandoned when larger substation transformers were installed. For ground fault detection, current transformers were installed in the ground conductor of each of the two main service feeders. The secondary circuit of the transformers was then connected to a ground annunciator alarm panel. This system is shown schematically in Figure 4.

Other Methods Considered

While this is as far as we have gone to date with a ground alarm for this power system, we have considered several methods of extending the ground detection to individual feeders. One method considered was to use three current transformers, one in each leg, with the secondaries connected in parallel and across a ground relay. Unfortunately, most of the 2400-v branch feeder circuit breakers on this system were supplied with only two current transformers, and the space in which to install a third current transformer of comparable size and type was very limited.

Consideration was then given to installing on each of the three conductors of each feeder, a low cost, bushing type of transformer with their secondaries connected in parallel and across a ground relay. We also considered installing a single bushing type transformer to encompass all three conductors. Since this would involve a considerable interruption of the plant's operation, and since the entire system is at present rather immune from grounds, we have not been inclined to push the installation of this type of system.

Even when we do decide, the object will be ground detection without simultaneously tripping of the feeder circuit breaker, since any unscheduled interruption of the service to any one of the feeders is to be avoided if at all practical.

Thus, in effect, this plant's power distribution system now has adequate protection from voltage surges due to arcing grounds and may eventually have full awareness as to what circuit may have gone to ground without having that circuit shut down. This will permit the grounded circuit to be isolated under controlled conditions with a minimum of interference to production and the ground cleared at the convenience of the operating and maintenance departments.

The continued use of a straight delta system at 2400 v with grounding transformers was considered but found to be less attractive financially than the 1380/2400-v system that was adopted.

In general, we recognized that resistance grounding of both the high voltage 2400 and 4160-v systems was desirable if these systems were to be extensive. This was considered for the reason that with resistance grounding the major potential drop between the grounded line and the grounded neutral takes place in the resistor and not in the ground path. Thus, personnel in the vicinity of the path of the ground current are not seriously endangered.

Figure 5 illustrates schematically the ground fault, tripping circuit for the 2400/4160-v resistance grounded systems and how personnel in the vicinity of ground fault are protected from high voltage.

Following is a description of this grounding system:

Ground current produced by fault at X is limited to 50 amps by grounding resistor R. Reactor in secondary circuit of current transformer provides potential across trip coil when contact on ground current relay (CR) closes to trip circuit breaker. The actual resistance of the ground path will vary with the distance between the point of the ground fault and the grounding electrode.

This resistance, when added to that of the grounding resistor, results in a lower current than the 50 amp maximum indicated. The current relay is set to trip on ground currents as low as five amps. Personnel in the vicinity of the path of the fault current through the ground or from a building structure to the ground are protected from service hazard by the fact that the resistance of that portion of the path that a man might be able to touch is usually less than two ohms. Thus, the maximum voltage which an individual might be subjected to is only 100 v, and generally much less. This voltage is equal to the ground current multiplied by the ground resistance in the vicinity of the personnel exposed to the ground current.

However, in small, high voltage distribution systems where there is a minimum possibility of a ground fault endangering personnel and where an interruption to service is relatively unimportant, the added expense of resistance grounding may not be justified.

Such seemed to be the case with the 2400/4160-v system that was to feed a single bank of 1000-kva transformers at one plant. The service was quite short and so presented a minimum hazard to personnel. Also, it could be interrupted for hours without serious effect on the process. For this system, solid grounding appeared to be quite proper and adequate.

What We Learned

In summary, from our present knowledge and experience on the Pacific Coast, resistance grounding would have been preferable for the two plants having the 277/480-v systems. In these two cases there was little advantage in being able to serve the major lighting loads directly from the power distribution system.

With resistance grounding the resistors should be capable of limiting the ground current to 10 amperes or less. Current transformers in conjunction with relays or ground lamps should be provided in the main bus to signal the presence of any ground in the system. Thus the system would have had the advantage of both a wye and a delta system with few of the disadvantages of either system. **End**

Incinerator is in fenced area on company's waste disposal site. Note stainless steel probe running up burner stack. This is used for scheduled sampling of the burner effluent to insure pollution-free exhaust.

No Pollution Here!

PLANT BURNS ITS CYANIDE WASTES

FORMERLY, disposal of toxic cyanide wastes presented air and water pollution problems at General Motors' Oldsmobile Division in Lansing, Michigan. Now, however, it has been successfully solved by burning off these wastes in a specially designed incinerator. Combustion efficiency of the incinerator is such that no detectable amounts of cyanide are present in the exhaust system.

The incinerator system is the brainchild of engineers at Prenco Manufacturing Co. of Royal Oak, Michigan. As installed, it is a semi-automatic operation, but it is presently undergoing modification to convert it to a fully automated arrangement.

This equipment consists basically of a giant refractory-lined steel stack, a burner unit and suitable storage tanks, hoppers, mixing vats, pumps, valves and controls. Complex cyanide wastes are delivered to the burner site, mixed with waste soluble oils, and burned off at high temperatures. The result is complete disposal. There is no detectable pollution of the air; and since it is no longer necessary to utilize public bodies of water for disposal, there is no danger of stream pollution.

At Olds, certain wastes are produced as free cyanide. These were formerly treated chemically to reduce the free cyanide to a level of legally acceptable toxicity. The treated waste was then dumped into the river.

Potassium carbonate and potassium ferrocyanide wastes were obtained formerly by evaporating them out of the cyanide baths used in electroplating operations. These wastes in turn were diluted with water and dumped.

The problem with this system was twofold. First, although toxic levels achieved through chemical treatment and dilution may have been legally acceptable, the wastes were toxic.

Second, proof of safety depends on the testing methods used. And the methods used by State authorities differed from those used at Oldsmobile to determine cyanide concentration.

This worked to Olds' disadvantage when analyzing samples containing the diluted ferrocyanide wastes. State testing methods consistently disclosed acceptable values for the free cyanide wastes. But the ferrocyanide waste samples occasionally showed an unacceptable pollution factor when tested by the State.

To correct the difficulty, Olds would have had to either dilute the ferrocyanide wastes with about 10 to 20 times as much water before dumping, or first isolate the free cyanide, then treat it chemically. Both methods were considered economically prohibitive.

Engineers at Oldsmobile had heard of Prenco's new industrial incineration concepts for the disposal of

soluble oils and complex wastes of various kinds. The question they asked was, "Would this equipment be capable of burning off a mixture of cyanide waste and soluble oil?"

A research program carried out by Prenco indicated sufficient feasibility to warrant undertaking an equipment design project. Construction, installation and final refinement of the system took more than a year.

All equipment, except for the burner unit and stack and related piping and accessories, is housed in an underground vault of reinforced concrete (40 ft long by 12 ft deep, inside dimensions). Trucks carrying gondolas with cyanide wastes are backed up a ramp to an opening in the top of the vault. Through this opening, wastes are dumped directly into a hopper, the first element in the disposal system. The hopper is designed to accept one standard load of waste material (about 1400 lb).

A screw type conveyor device at the bottom of the hopper performs a dual role. It both transports the waste to the pre-mix tank and crushes it to an acceptable granule size while doing so.

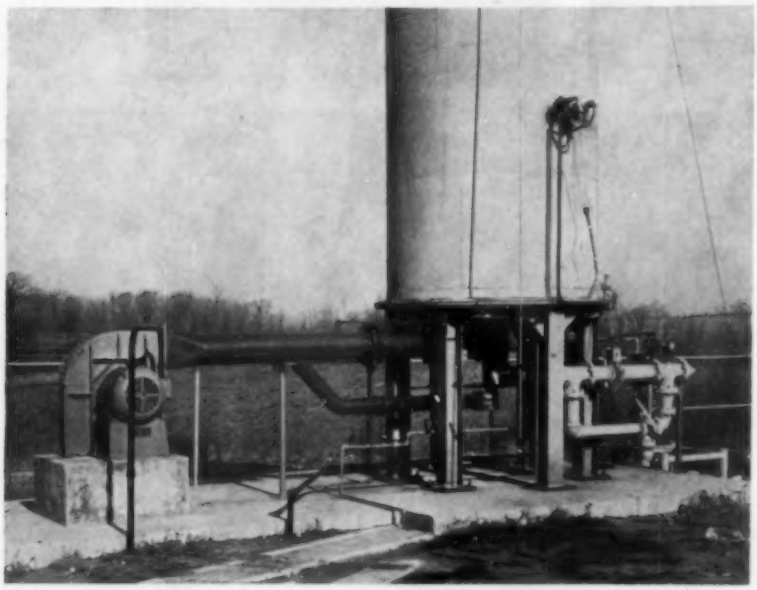
The pre-mix tank is unique in that it has a built-in weight controller that works automatically. The tank is supported on precision springs of positively known deflection characteristics. When precisely 1200 lb (enough for one "batch") of cyanide waste has been delivered into the tank, a limit switch is automatically tripped, stopping the conveyor.

In the pre-mix tank, 75 gallons of water are added. A motor-driven mixer equipped with a pulverizing blade mixes the water with the cyanide waste to form a slurry. The slurry is pumped from the pre-mix tank to a blending tank where 1200 gallons of soluble oil are added. These ingredients are blended by a marine propeller type agitator. From the blending tank, the mixture is pumped to a 1500-gallon holding tank, ready for burning.

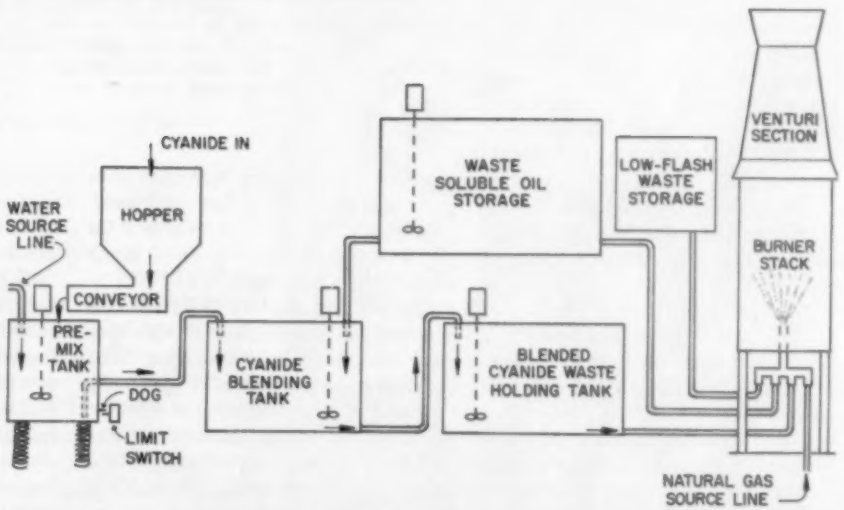
An annunciator type control panel permits combined visual monitoring and control of all burner functions from a control room within the underground vault. Its unique panel face, with functional back-lighted component silhouettes, is fabricated of opaque plastic by a special process.

A glance at the annunciator reveals what combination of several operations is being performed at any given moment as well as the stage of development of each operation. The back-lighted silhouettes make it easy to understand; with a minimum of education and training, an operator can understand the complete pattern of component sequencing and system operation.

All annunciator wiring, bulbs and switches are mounted within a sturdy steel cabinet. The complete electrical



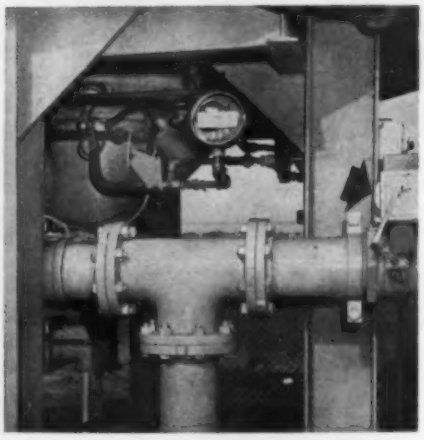
Above: Combustion air is supplied by pressure blower at left. All piping and operating components are readily accessible, thanks to five-foot tall I-beam legs which support the incinerator stack.



Schematic drawing shows how system disposes of blended soluble oil-cyanide wastes. System is designed to permit use of natural gas to bring burner to temperature and to permit burn-off of either soluble oil waste or low-flash waste in addition to burning the blended waste.

Left: Gondola, containing cyanide waste, is up-ended at edge of hopper.

Below: Flow controller (black arrow) is mounted on inlet piping. Flame detector (arrow, left) will shut system down in the event of a flameout.



Waste soluble oil is brought to the incinerator site in special portable tanks. Here, the oil is being transferred to underground storage tank.

CYANIDE WASTES

system is readily accessible from the rear of the cabinet.

The system was designed at Oldsmobile's request to permit flexibility of mixing and burning. Soluble oil wastes and low-flash liquids (like paint thinners and waste gasoline) formerly had been taken to a dump and burned off. Although this was acceptable when no other course was open to them, the Olds engineers recognized that an air pollution problem existed, to a great or small degree, depending upon what was being burned.

The incinerator system has holding tanks for oil-blended cyanide slurry, soluble oil wastes and low-flash wastes. The line to the burner can be opened to admit any of the following: (1) Cyanide-soluble oil blend, (2) Soluble oil alone, or (3) Low-flash waste alone.

The burner will handle any of these without altering any burner components and without changing any controls.

In starting up from a cold burner, the gas pilot flame is first lighted. An ultra-violet flame detector unit, which monitors the burner flame, is energized. The ultra-violet detector is employed because it can differentiate between flame and refractory glow.

With the pilot flame burning, gas or low-flash auxiliary fuel can be admitted to pre-heat the burner. Temperature is gradually increased at a rate of 150 to 200 F per hour until the burner registers in excess of 2200 F, the required temperature at which incineration can begin.

Burner temperature is further increased as introduction of the cyanide-soluble oil mix is begun. The auxiliary fuel volume is gradually reduced as the temperature rises to 2500 F, at which temperature the auxiliary fuel is cut off completely. The temperature controller, which is part of the control panel, is pre-set to hold 2500 F within a few degrees.

At full volume setting, the cyanide-soluble oil blend is burned off at a rate of 150 gallons per hour.

The burner is provided with an auxiliary air blower, which provides combustion air in excess of that required to insure complete combustion. In addition, the stack is provided with a venturi section (dilution air inlet) which draws in additional air as the exhaust gases leave the stack. The combination effect of the blower plus the venturi insures the absence of detectable amounts of cyanide in the exhaust stream. **End**

MEASURE YOUR MATERIALS HANDLING EFFICIENCY Using These Seven Ratios

TAKE EIGHT HOURS of your time and add seven basic efficiency cost ratios as bench marks and you will have the tools to assist you in evaluation of the elusive costs of handling materials. The cost ratios were compiled jointly by Yale & Towne Materials Handling Division and Professor James R. Bright of Harvard.

The "Management Guide To Productivity" that will help you expose unwarranted handling expense was introduced by Paul R. Hartig, Vice President of Yale & Towne, prior to the opening of the Material Handling Institute's Eastern States Show at Philadelphia's Convention Hall on May 9-11.

Mr. Hartig, in reporting that materials handling accounts for between 20 to 30 per cent of a product's cost, said "Obviously, here is an area that cries out for the sharpest scrutiny by management as it pursues its eternal goal of cost reduction."

Field-tested by Professor Bright and his students of the Industrial Management Center, Lake Placid, N. Y., these ratios are being applied by Yale & Towne and by many other technical specialists.

A resume of the seven ratios, with a brief description of their functions and aims, follows. Each of the seven ratios attacks a potential loss area in your plant.

1. MATERIALS HANDLING LABOR RATIO

$$\text{MHL Ratio} = \frac{\text{Personnel Assigned to Materials Handling Duties}}{\text{Total Operating Workforce}}$$

This ratio answers the question: How big a job is materials handling in our plant? It also will help you explore the question: How much effort do we plan to put into the broad function of material movement and storage, as distinct from production? Use payroll dollars of personnel assigned to each task, as it will give a more specific measure of the amount of skills and responsibilities of the task. In the "Management Guide To Productivity" a complete work sheet for each ratio is provided, as shown in Fig. 2 for the MHL Ratio.

2. DIRECT LABOR HANDLING LOSS RATIO

$$\text{DLHL} = \frac{\text{M H Time Lost by Direct Labor}}{\text{Total Direct Labor Time}}$$

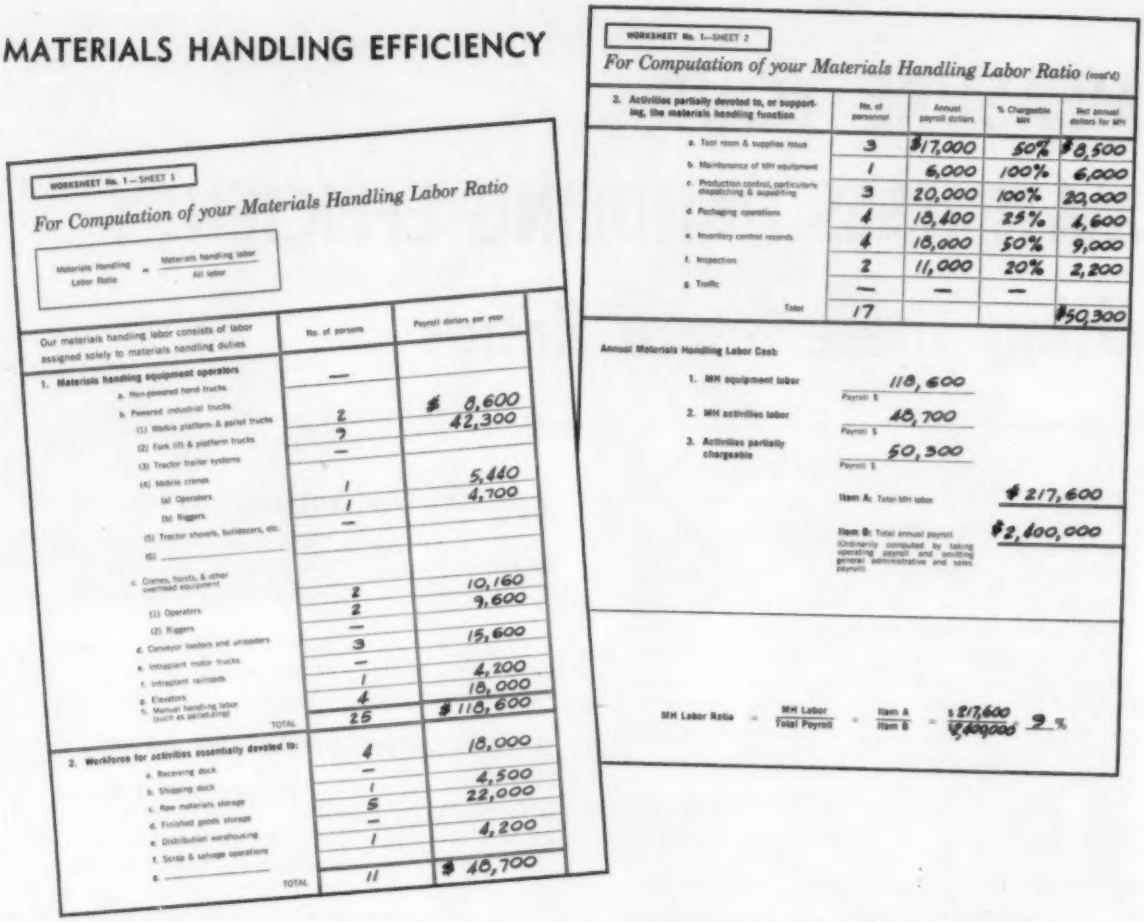
This will indicate to you if highly skilled people are being diverted from their primary production duties because they move materials.

3. MOVEMENT/OPERATION RATIO

$$\text{M/O Ratio} = \frac{\text{Total Number of Moves}}{\text{Total Number of Production Operations}}$$

This is an indicator of the general handling plan, so, it need be applied to only a few key products or parts that

Fig. 1. Professor James R. Bright of Harvard, left, co-author of "Management Guide To Productivity" points out a prime factor in his book on materials handling to Plant Engineering's Associate Editor Ken Lawson.



WORKSHEET No. 1—SHEET 1

For Computation of your Materials Handling Labor Ratio

Materials Handling Labor Ratio = Materials handling labor / All labor

Our materials handling labor consists of labor assigned solely to materials handling duties	No. of persons	Payroll dollars per year
1. Materials handling equipment operators	—	
a. Non-powered hand trucks	2	$ 8,600
b. Powered industrial trucks	2	42,300
(1) Walkie platform & pallet trucks	—	
(2) Fork lift & platform trucks		
(3) Tractor trailer systems	1	5,440
(4) Mobile cranes	1	4,700
(a) Operators	—	
(b) Riggers		
(5) Tractor shovels, bulldozers, etc.		
(6) _____		
c. Cranes, hoists, & other overhead equipment	2	10,160
(1) Operators	2	9,600
(2) Riggers	—	
d. Conveyor loaders and unloaders	3	15,600
e. Intraplant motor trucks	—	
f. Intraplant railroads	1	4,200
g. Elevators	4	18,000
h. Manual handling labor (such as palletizing)		
TOTAL	25	$ 118,600
2. Workforce for activities essentially devoted to:	4	18,000
a. Receiving dock	—	
b. Shipping dock	1	4,500
c. Raw materials storage	5	22,000
d. Finished goods storage	—	
e. Distribution warehousing	1	4,200
f. Scrap & salvage operations		
g. _____		
TOTAL	11	$ 48,700

WORKSHEET No. 1—SHEET 2

For Computation of your Materials Handling Labor Ratio (cont'd)

3. Activities partially devoted to, or supporting, the materials handling function	No. of personnel	Annual payroll dollars	% Chargeable MH	Net annual dollars for MH
a. Tool room & supplies issue	3	$17,000	50%	$8,500
b. Maintenance of MH equipment	1	6,000	100%	6,000
c. Production control, particularly dispatching & expediting	3	20,000	100%	20,000
d. Packaging operations	4	18,400	25%	4,600
e. Inventory control records	4	18,000	50%	9,000
f. Inspection	2	11,000	20%	2,200
g. Traffic	—	—	—	
Total	17			$50,300

Annual Materials Handling Labor Cost:

1. MH equipment labor (Payroll $)	118,600	
2. MH activities labor (Payroll $)	48,700	
3. Activities partially chargeable (Payroll $)	50,300	
Item A: Total MH labor		$ 217,600
Item B: Total annual payroll (Ordinarily computed by taking operating payroll and omitting general administrative and sales payroll)		$2,400,000

MH Labor Ratio = MH Labor / Total Payroll = Item A / Item B = $217,600 / $2,400,000 = 9 %

Fig. 2. **An example of how each of the seven ratios is calculated is shown above in a completed sample worksheet for the Labor Ratio. Here, it is nine per cent.**

cross-section your raw materials. It will let you examine the relative efficiency of your handling plan.

4. MANUFACTURING CYCLE EFFICIENCY

$$MCE = \frac{\text{Sum of All Production Operation Cycle Times}}{\text{Elapsed Time in the Production System}}$$

Waiting time that cannot be controlled because of its relation to the production step should be counted as part of production time. This ratio suggests the efficiency with which the plant operates as a system for putting materials through required processes.

5. SPACE UTILIZATION EFFICIENCY

$$SUE = \frac{\text{Cubic Feet Usefully Occupied}}{\text{Net Usable Cube}}$$

Are you taking full advantage of the space in which you have invested? When calculating net usable cube do not deduct for space which is used for aisles, or so-called "working areas."

6. EQUIPMENT UTILIZATION RATIO

$$EU\ Ratio = \frac{\text{Actual Output}}{\text{Theoretical Capacity}}$$

This raises the question: "Are our important production machines operating at a reasonable percentage of their theoretical capacity?" By establishing this efficiency, you can consider whether development of better handling facilities or techniques will significantly increase output.

7. AISLE SPACE POTENTIAL

$$ASP = \frac{\text{Current Aisle Floor Space, Minus Theoretical Optimum Aisle Floor Space}}{\text{Current Aisle Floor Space}}$$

This ratio is especially pertinent to storage operations and highlights your opportunity to pick up building spaee by taking advantage of advances in handling equipment, such as narrow aisle handling systems.

Odds are great that a quick check with these ratios will help spot one or more areas where you can make a major savings. The book that outlines the procedures necessary to accomplish the above purposes is available without cost, upon request to Yale Materials Handling Division of The Yale & Towne Manufacturing Co., 11000 Roosevelt Blvd., Philadelphia 15, Pa. **End**

TRAINING MAINTENANCE WELDORS

Part III—Selecting Arc-Welding Electrodes

By **John W. Rantala and Jack Arzoomanian**, Training Div., Maintenance Dept., Abbott Laboratories, North Chicago, Illinois

IN THIS SECTION we will present general information about arc-welding coatings and information on the American Welding Society classification of mild steel and low-alloy steel arc welding electrodes. In addition, we will discuss the A. W. S. color code used for identification of arc-welding electrodes and provide general information on the recommended uses for the various types of mild steel and low-alloy arc welding electrodes.

When highly heated, steel will readily combine with oxygen and nitrogen in the air surrounding the arc. The resulting oxides and nitrides are responsible for brittleness. In order to protect the weld metal from the harmful effects of air, during the time the metal is molten and solidifying, some form of protection must be provided. This protection is in the form of gaseous smoke and slag generated from the electrode coating. The smoke is liberated in the arc stream and the slag is carried across the arc gap to be deposited as a slag blanket over the weld.

Besides providing protection for the hot and molten metal from the harmful effects of air, the electrode coating provides fluxing ingredients that clean the molten metal and electrical insulation along the length of the electrode. In addition, the coating provides ingredients that stabilize and sustain the arc and adds alloying ingredients to the molten weld metal. The coating provides a crucible or cup end in which the rapidly expanding gases combine with the electromotive forces to "shoot" the molten metal across the arc gap. In some special drag type electrodes, the depth of the cup end establishes the correct arc length.

Various types of metallic arc welding electrodes may be grouped as bare electrodes, light-coated and shielded-arc or heavy-coated electrodes. In this discussion, we are concerned only with the heavy-coated electrodes.

Coatings of the two principal types of heavy-coated or shielded-arc electrodes are manufactured from two general types of materials, namely cellulose or mineral coatings. Cellulose-coated electrodes are covered with materials obtained from wood pulp, sawdust, cotton or various compositions derived from the manufacture of rayon.

Mineral-coated electrodes are coated with materials such as asbestos, clay, lime, iron oxide and iron powder. To simplify these two types of coatings further, it may be pointed out that cellulose coatings depend mainly upon smoke as the gaseous shielding around the arc stream and the molten metal. A light slag is also produced by this coating.

On the other hand, mineral-coated electrodes depend mainly upon slag as a shield. This slag acts to slow down the cooling rate of the molten metal. Protective action of typical electrode coating is shown in Fig. 57.

A number and color code system has been established by the American Welding Society for identification of electrodes. This numbering system is based upon the use of four- and five-digit numbers which identify certain characteristics of the electrodes.

All mild steel and low-alloy electrodes are coded with four- or five-digit numbers such as E-6010, E-7020, E-9010, E-10010, E-12015 and so forth. The breakdown explaining the meaning of the numbers is shown in Fig. 58.

First two digits of a four-digit number or the first three digits of a five-digit number are always read together. They designate the minimum required tensile strength in thousands of pounds per square inch that the electrode must develop in order to be classified under that particular number. The E-6010 electrode for example has a minimum tensile strength of 60,000 psi; E-7011 has a tensile strength of 70,000 psi; E-10015 has 100,000 psi; and so on.

The next digit, being either the third or fourth, specifies the position, or positions, in which the electrode can be used most satisfactorily. This digit will be 1, 2, or 3 and indicates the recommended welding position as follows:

1—All positions—F, H, V, OH
2—Flat and horizontal—F, H
3—Flat position only—F

Last digit used in this code may be 0, 1, 2, 3, 4, 5, 6, 7, or 8. It refers to the type of current recommended

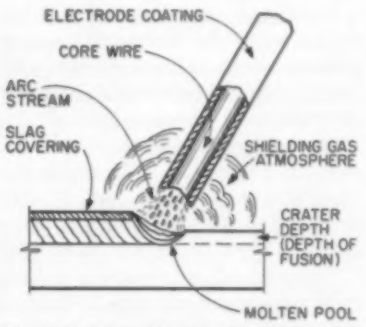


Fig. 57. Protective action of typical mineral coated arc welding electrode.

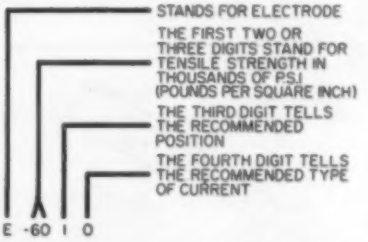

STANDS FOR ELECTRODE
THE FIRST TWO OR THREE DIGITS STAND FOR TENSILE STRENGTH IN THOUSANDS OF PSI (POUNDS PER SQUARE INCH)
THE THIRD DIGIT TELLS THE RECOMMENDED POSITION
THE FOURTH DIGIT TELLS THE RECOMMENDED TYPE OF CURRENT
E -60 1 0

Fig. 58. American Welding Society number system identifies electrodes.

and also indirectly to the type of electrode coating.

0—d-c reverse polarity only when the third digit is 1
0—d-c reverse polarity; a-c when the third digit is 2 or 3
1—a-c* or d-c reverse polarity
2—d-c* straight polarity or a-c
3—a-c* or d-c straight polarity
4—d-c either polarity or a-c. This is an iron powder coating electrode
5—d-c reverse polarity. Low hydrogen electrode
6—a-c* or d-c reverse polarity. Low hydrogen electrode
7—d-c straight polarity or a-c for horizontal fillet welds; d-c either polarity or a-c for flat position welding. This is an iron powder coating electrode
8—d-c* reverse polarity or a-c. Low hydrogen iron powder coated electrode
* Indicates preferred current

The electrode color marking code of the American Welding Society consists of a primary mark located on the top end of the electrode extending down about 3/16 in. from the end. A secondary mark, consisting of a small spot is located near the top end of the electrode, Fig. 59. Color markings for nine of the most popular electrodes are shown in Fig. 60.

Particularly recommended for multi-pass work, the E-6010 d-c reverse polarity electrode has a deeply penetrating, forceful spray-type arc. Good penetration is characteristic of this electrode. Quick freezing of the weld metal and slag make it applicable for vertical and overhead work. E-6010 is classified as an all-purpose electrode.

Majority of applications are on mild steel and it can also be used on galvanized and low-alloy steels. Good fit-up is essential to good work with this electrode. Typical applications are building construction, bridges, storage tanks, piping, pressure vessel fittings and ship building.

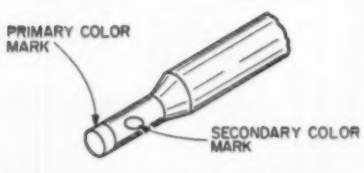


Fig. 59. A. W. S. color code identifies individual electrodes in the field.

Maximum currents that can be used with this electrode are a little lower than for mineral-coated electrodes such as E-6012, E-6013, and E-6030. Approximate current ranges for the common sizes or electrodes are shown in Fig. 61. When welding in the overhead or vertical position, current values near the lower end of the range should be used. This type of electrode is manufactured in sizes larger than 5/16 in. but the larger sizes are not used for vertical or overhead welding.

The E-6011 a-c or d-c reverse polarity electrode is designed to perform the same work using alternating current that the E-6010 does with direct current. Although usable with d-c reverse polarity, it will not perform quite as well on d-c.

This type of electrode provides the important a-c advantage of no arc blow. For the welding of some structures or items having numerous inside corners, this can be very helpful. The recommended current ranges are the same as those for the E-6010. As in the case of the E-6010 electrodes, high current values increase the spatter loss.

For medium penetration, the E-6012 d-c straight polarity or a-c electrode is recommended. This has a quiet type of arc with very little spatter and a dense slag that completely covers the weld. Core wire used is the same as that used for E-6010 and E-6011 electrodes. This electrode is recommended for single pass welds only. Multipass welds made with this electrode will not pass x-ray examination.

Although E-6012 is an all-position electrode, far greater quantities are used in the flat and horizontal positions than the vertical and overhead positions. It is especially recommended for single pass, high speed, high current, horizontal fillet welds. This electrode will withstand high currents used with good fit-ups or will perform satisfactorily on lower current values and bridge the gaps of a poor fit-up. Recommended current values for various sizes of E-6012 electrodes are shown in Fig. 62.

Because of its shallow penetration or depth of fusion, this electrode will weld alloy and higher carbon steels with less cracking. The weld metal deposited is slightly higher in tensile strength but lower in ductility than weld metal from E-6010 or E-6011. The E-6012 weld metal also contains more non-metallic inclusions.

ELECTRODE NUMBER	END OR PRIMARY	SPOT OR SECONDARY
E-6010	None	None
E-6011	None	Blue
E-6012	None	White
E-6013	None	Brown
E-6020	Blue	None
E-6030	White	None
E-7010	None	Green
E-7011	None	Red
E-7020	Blue	Green

Fig. 60

Electrode Diameter (in inches)	Current (amps)
3/32	30-80
1/8	80-120
5/32	120-160
3/16	140-220

Fig. 61

Electrode Diameter (in inches)	Current (amps)
1/16	20-40
3/32	30-80
1/8	80-130
5/32	120-180
3/16	140-250
1/4	200-400

Fig. 62

Well adapted to the welding of thin gage materials, the E-6013 a-c or d-c straight polarity electrode is similar to the E-6012 with some added advantages. Slag is easier to remove and the arc is easier to strike and sustain with the smaller diameter electrodes. In addition, vertical down welding can be done more satisfactorily and the bead surface is smoother with a finer ripple.

Penetration is shallower than the E-6012 electrode and the high welding currents used with the E-6012 cannot be used with E-6013. A list of recommended current values for various sizes of E-6013 electrodes are shown in Fig. 63.

When using normal current values the E-6020 d-c straight polarity or a-c medium penetrating electrode is well suited to making horizontal fillet welds. Deep penetration can be obtained with higher current values so this electrode can also be used for

deep fillet welds in the flat position.

This electrode has a spray type arc and a heavy slag that can easily be removed. It is not normally used on thin sections. Applications include pressure vessels, heavy machine bases and structural parts where thickness of the metal permits the use of higher current values. Recommended current values for various sizes of E-6020 electrodes are shown in Fig. 64.

This electrode is recommended for horizontal fillets and flat position welds that must pass rigid x-ray examination. In deep fillets, the face of the weld may be dimpled for the first few passes but this dimpling does not reduce weld quality. The dimpling does not appear in the finishing passes.

The E-6030 d-c straight polarity or a-c electrode is similar to the E-6020 except that it deposits weld metal faster and is a flat position electrode only.

It is recommended for the welding of heavy plate, machine bases, structural parts and pressure vessels where deep narrow grooves are the rule rather than the exception. Current values used are the same as those used for the E-6020. It is interesting to note that some brands of E-6030 perform better on d-c reverse polarity.

A low hydrogen type electrode, the E-6015 d-c reverse polarity, was developed for welding higher strength low-alloy steels and high carbon steels that are subject to underbead cracking. E-6015 can be used to advantage in welding the free machining sulfur bearing steels. This electrode has also been found useful in welding malleable iron and spring steels.

Currents used for these electrodes are higher than those used for E-6010 electrodes. It is recommended that a short arc be maintained when welding vertical or overhead. A minimum of manipulation will produce the best results. Recommended current values to use with various sizes of E-6015 are shown in Fig. 65.

The E-6016 a-c or d-c reverse polarity electrode has all the characteristics of the E-6015. It has been developed to provide the advantages of a low hydrogen electrode for a-c welding applications. Coatings on the E-6015 and E-6016 must be kept free of moisture. Dry storage is essential for satisfactory performance.

One of the fastest depositing electrodes produced is the E-6024 a-c or d-c either polarity. This electrode contains a high per cent of iron powder in its coating which fuses along with the core wire. Due to the thick coating and arc cup produced, the "drag" technique of welding is often used with this electrode.

It is well suited for fillet welds in mild steel. The welds are slightly convex with a very fine ripple and smooth surface. The electrode has a smooth, quiet arc; very low spatter and low penetration. Although recommended for mild steels, it produces satisfactory welds on low alloy, medium and high carbon steels. Recommended current values for various sizes of E-6024 electrodes are shown in Fig. 66.

Another type of iron powder-coated electrode is the E-6027 for use on a-c or d-c either polarity for flat position welding or a-c or d-c straight polarity for horizontal fillets. It has a spray type arc stream and deposits metal at a high speed.

Current ranges for the various diameters, Fig. 67, are higher than for all other classifications of electrodes. The weld metal can pass rigid x-ray examination.

Electrodes of the E-70, 80, 90, 100 and 120 series have essentially the same coatings as the mild steel E-60 series. The improved mechanical properties of the weld metal are obtained through changing the chemical properties of the core wire.

Steels welded with low-alloy steel electrodes are usually used for specific purposes. The welding of these steels requires an understanding of their properties and heat treatment. The four common categories of low-alloy steel electrodes are:

A1. Carbon-molybdenum steel
B1. Chromium-molybdenum steel
C1. Nickel steel
D1. Manganese-molybdenum steel

A complete classification number identifies the alloy group with a letter following the A. W. S. number. The letter identifies the chemical composition and alloy group to which the electrode belongs. Examples are E-7010-A1, E-8015-B1, E-8018-C1 and E-9016-D1.

Knowledge of the alloy content of the metal to be welded is essential to electrode selection. This selection is often based upon choosing an electrode that will deposit weld metal of the same chemical composition as the base metal. **End, Part III**

Part IV will discuss destructive testing of welds.

Electrode Diameter (in inches)	Current (amps)
1/16	20-40
5/64	25-50
3/32	30-80
1/8	70-120
5/32	120-170
3/16	140-240
1/4	170-300

Fig. 63

Electrode Diameter (in inches)	Current (amps)
1/8	100-140
5/32	120-180
3/16	175-250
7/32	200-325
1/4	250-400
5/16	350-450

Fig. 64

Electrode Diameter (in inches)	Current (amps)
3/32	30-80
1/8	70-120
5/32	120-170
3/16	140-240
1/4	200-350

Fig. 65

Electrode Diameter (in inches)	Current (amps)
3/32	80-130
1/8	120-200
5/32	180-240
3/16	240-300
7/32	275-350
1/4	300-400

Fig. 66

Electrode Diameter (in inches)	Current (amps)
1/8	130-210
5/32	200-275
3/16	250-325
7/32	280-370
1/4	350-450

Fig. 67

POTOMAC — Fred Fryberger, fifth from left, presents chapter charter to J. Ashby Williams, Jr. The Chapter of the Potomac is the 57th chapter to join the AIPE.

PLANT ENGINEERS' ACTIVITIES

Charter and Scroll Presentations

HERE ARE A few highlights of events taking place at meetings of the various Plant Engineers' Chapters.

Twin City

Members of the Twin City Chapter of the AIPE have prepared a very attractive booklet. It includes the following items: a listing of the 1960-1961 chapter officers; the names of the committee chairmen; the program for the full year; a list of all their members, including phone number contact; the names of the past presidents; and a brief write-up of the Constitution and By-Laws.

Other chapter secretaries might be interested in obtaining a copy. The person to contact is M. Frisch, Waldorf Paper Products Co., 2250 Wabash Ave., St. Paul 14, Minn.

Potomac

Many members of the Potomac Chapter were on hand during the presentation of the charter to the chapter. Fred Fryberger, plant engineer of Food Machinery and Chemical Co., Baltimore, Md., and National President of the AIPE, presented the charter.

Seated, left to right, in the photograph are: F. Terman, U. S. Navy; S. L. Ely, Base Maintenance Division, U. S. Air Force; R. G. Kaiser, Bureau of Indian Affairs; A. A. Dach, Sealtest Foods; F. Hoffmaster, Vitro Electronics; R. J. Johnson, U. S. Navy; T. Knox and G. Lippy, both of Vepco.

Standing, left to right, are: R. W. Laird, Atlantic Research Corp.; R. T. Powell, Melpar, Inc.; R. J. Hammer, Naval Weapons Plant; W. C. Lockhart, Jr., Sealtest Foods; Fred Fryberger; J. Ashby Williams, Jr., Technical Management Branch, U. S. Air Force; C. W. Baldwin, Melpar, Inc.; E. H. Dage, Bureau of Indian Affairs; J. E. Pond and J. S. Young, both of Melpar, Inc.; C. S. Addams, Vitro Electronics; and J. R. Black, Vepco.

Orange County (California)

The Orange County Chapter took an active part in National Engineers' Week which was celebrated in the Orange County area in February.

Among the many members who helped make this a successful event was Mark Levenson, President of the chapter. He was on the committee to arrange the Annual Joint Engineering Societies Banquet. He is with the Ador Corp., Fullerton, California. Another active member was George F. Grabe, whose assignment was arranging the plant tours. He is the plant engineer at the Electronic Engineering Company of California, Santa Ana, California.

Pittsburgh

The Pittsburgh Chapter of the American Institute of Plant Engineers awarded Past President Wes Kerr, of Libbey-Owens-Ford Glass Co., a "Recognition" scroll and pin.

Art Bossert, of Cornell Aeronautical Laboratory, Buffalo, New York, was present at this meeting. He is the Regional Vice President of Region 2.

Appearing in the Pittsburgh photograph below are, l to r: Art Bossert; T. Bieber, of Westinghouse Air Brake, chapter delegate; Wes Kerr; and Lou Sitomer, of Neville Chemical Company, President of the Pittsburgh Chapter. **End**

PITTSBURGH—Lou Sitomer, Pittsburgh Chapter President, right, presents scroll to Wes Kerr. Looking on, are: Regional Vice President Art Bossert, left, and T. Bieber, National Delegate of the Pittsburgh Chapter.

B. GENERAL WORK — Part II CONCRETE

CONSTRUCTION SPECIFICATIONS

By R. E. WALLIN, Chief Engineer, Construction, Plant Engineering Dept., Joseph T. Ryerson & Son, Inc.

CONCRETE WORK

CONSTRUCTION LINES. It should be designated who will stake out and set lines and establish bench and reference points for the building from the data furnished on the construction drawings.

Before commencing any work, each contractor should check all lines and levels shown on the drawings as they affect his work, and, should there be any discrepancies, he should report them to the engineer for adjustment and advice.

WORK OF OTHER CONTRACTORS. It is common practice for the concrete contractor to build into his forms all sleeves, hangers, anchors, conduits, blocking, piping, bucks, nailing strips, etc., required to be placed in his concrete work by other trades before pouring concrete. This also applies to work built into masonry. He should verify and have other contractors verify the locations and levels of all such work before proceeding with the pouring of concrete.

It is also common practice to have the concrete contractor set all anchor bolts and grout all base plates furnished to him by other contractors. Such other contractors should work with the concrete contractor in setting these units and should check and verify all such settings.

There are cases where other work or installed equipment is built into or interferes with completion of concrete work, and it therefore becomes necessary for the concrete contractor to allow other contractors to install their construction and equipment, and he then builds his work around the work of the others. Sometimes he must temporarily leave out portions of his work, and, when this is done, the other contractors should complete their work and remove their construction equipment as quickly as possible after their work is finished so that the concrete contractor can complete his work.

It is important that contractors furnish adequate, complete, and modern equipment for handling, processing, and placing materials to permit proper and speedy construction.

WORKMANSHIP AND MATERIALS. It should be emphasized that: all workmanship shall be equal to the latest and best practice in modern construction; work must be first-class in all respects; greatest care must be exercised to make concrete work uniform and dense, of the required strength, and true to elevations and lines shown on the drawings; materials used should be the very best of their respective class or kind; materials shall be subjected to a rigid examination, and, if found defective, undersize, or oversize, or otherwise unsuitable or not as specified, they will be condemned and promptly

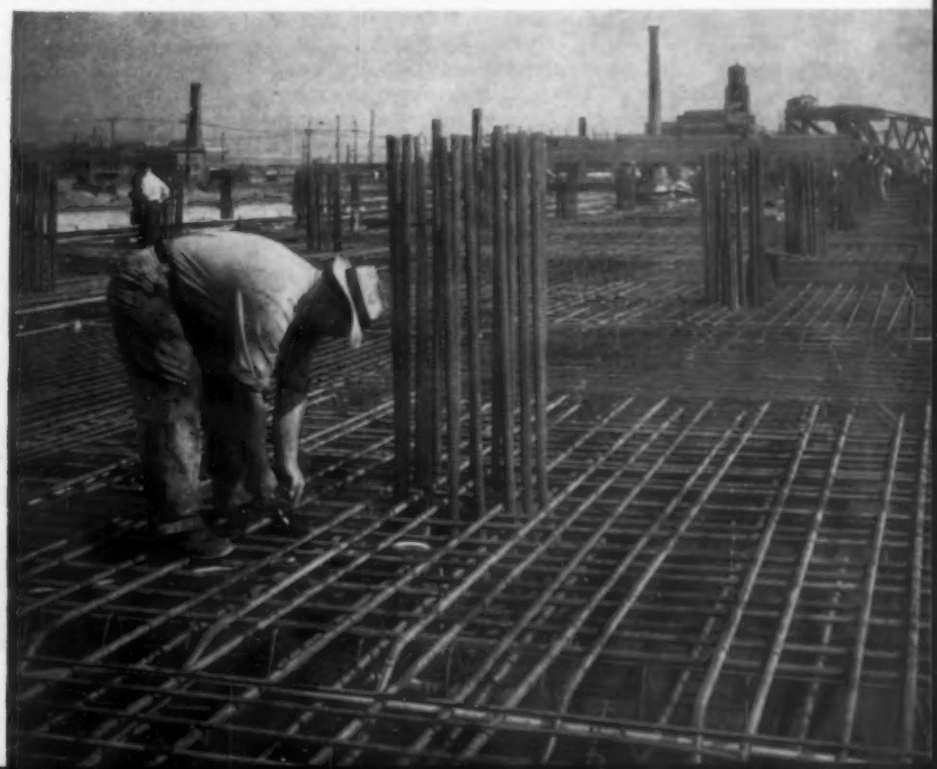


Fig. 1. Proper size, placement of reinforcing bars is vital to concrete's strength.

removed from the premises; and materials must be protected from the weather or other damage.

CEMENT-AGGREGATES-WATER. In most areas of the United States, and also in other countries, materials for concrete work are designated by accepted uniform, standard specifications. Normally all cement should be portland cement of approved, standard established brand, and all the same approved manufacturer's batch made in accordance with specifications of A.S.T.M. serial designation, shipped in barrels or in good sacks containing 94 lb, and must be in properly protected storage.

Concrete aggregates should meet standard specifications outlined in A.S.T.M. serial designation. Many times the use of the hardest aggregate available at the time of construction in the vicinity of the job will be requested; at other times the contractor will be referred to a testing laboratory for mix specifications.

It is important that fine aggregates and/or sand be clean, hard, strong, durable, uncoated grains, free from injurious amounts of dust, lumps, soft or flaky particles, shale, oil, or organic matter, loam, or other deleterious substances. It is best that sand not contain more than three per cent by weight of clay by decantation test nor more than three per cent of mica by volume. The specifications should outline the mesh composition of sand.

Generally, the coarse aggregates should consist of clean, hard, durable particles of close-grain crushed rock, gravel, or crushed gravel, and be free from injurious amounts of soft, friable, thin, elongated, or laminated particles, loam, or organic or other deleterious matter, and should have a specified specific gravity.

Water for mixing concrete should be fresh and free from solids, sewage, acids, alkalies, organic matter, or other impurities likely to be injurious to concrete. Sometimes engineers will state that the contractor may at his own expense use an admixture approved by the engineer.

PROPORTIONING AND CLASSIFICATIONS. All concrete should be mixed in proportions which are sufficiently workable to produce a uniform, dense concrete that can be poured without segregation and to the strength specified.

The size of the section being poured, or other structural conditions that may influence the securing of uniform, dense, neat stripping concrete, will determine the maximum size of the aggregate which should be used.

Class A concrete should have a minimum compressive strength of 3000 psi in 28 days and will generally consist of one part cement to six parts of fine and coarse aggregates measured separately using $\frac{7}{8}$-in. maximum size aggregate. The consistency should be represented by a specified slump dimension.

Class B concrete should have a minimum compressive strength of 2500 psi in 28 days and shall consist of one part cement to $6\frac{1}{2}$ parts of fine and coarse aggregates measured separately, using $1\frac{1}{4}$-in. maximum size aggregate. The consistency should be represented by specified slump dimension.

Class C concrete shall consist of one part of cement to ten parts of fine and coarse aggregate measured separately, using $1\frac{1}{4}$-in. maximum size aggregate, or one part cement to eight parts of fine and coarse aggregate measured separately, using $\frac{7}{8}$-in. maximum size aggregate. Strength requirements do not apply to this class of concrete, since it is generally used as bulk filler.

CONSISTENCY. Materials should be mixed with a minimum amount of water to produce a concrete of required consistency to give a workable mix that will produce a uniform, dense concrete of the strength specified, without voids.

MIXING. It is optional whether the contractor uses "ready-mix" or on-the-job machine-mixed concrete.

The re-mixing of concrete that has partially set should never be permitted. No concrete should be deposited in the work which has begun to set, and in no case should concrete be deposited that has been mixed for a period longer than one-half hour.

PLACING CONCRETE. Concrete, after being mixed, should be immediately deposited without separation of ingredients and thoroughly vibrated or puddled or tamped so that all parts of the formwork are filled. Special care should always be taken to work concrete through and around reinforcing steel.

The contractor should use as many vibrators and tampers as he considers necessary to secure the desired results for the various parts of the structure. An extra vibrator must be on the job ready for service in case any of the vibrators in use should cease to function.

Overvibration of concrete should not be permitted. However, care should also be exercised not to undervibrate, and the work of vibrating should be done by selected men who have been fully instructed in the use of the equipment. Uniform appearance of surfaces must be obtained.

Concrete must never be deposited in formwork or areas containing water.

Footings must be poured as a monolith to their tops

Fig. 2. Pre-set inserts for trades—electrical, heating, etc., preclude need for costly cutting of poured concrete slab.

in one continuous pour unless otherwise designated on the drawings or instructed by the engineer.

CONSTRUCTION JOINTS. All construction joints in walls should be keyed as approved by the engineer.

In all pouring of concrete, every care must be taken not to disturb the reinforcing steel or other inserts.

GROUTING. Immediately before pouring concrete into wall forms and forms for horizontal beams and girders, a uniform layer of grout three inches deep should be placed in the bottom of the formwork.

PATCHING. Immediately after removing forms, all concrete surfaces should be inspected and all pour-joints, voids, or pockets in the surfaces should be repaired.

After thoroughly wetting the surface to be patched, the mortar should be thoroughly compacted into place and finished neatly on the exposed surface to simulate the finish in the rest of the work.

FORMS. Forms and formwork for concrete must be complete and of strength and construction which will prevent spread, shifting, or settling when concrete is deposited therein. The formwork should be tight enough to avoid leakage and washing out of the cement mortar from the concrete.

Special care must be taken to determine that forms are true to required lines, grades, and surfaces, so as to give a neat and workmanlike finish to the surfaces after the formwork is stripped.

Inspection must be made to see that all dirt, chips, sawdust, rubbish, water, etc., are completely removed from the formwork before any concrete is deposited therein. No wood ties or blocking should be left.

The wetting of wood forms must be started at least 12 hours before concreting. Plywood forms for surfaces which will be exposed to view should be oiled.

Forms must not be removed until authorized by the engineer.

Fig. 3. Supervised pouring of each batch of concrete provides "insurance" that floor slab will be of design strength.

CONCRETE FLOORS AND SLABS. Pouring of concrete floors and slabs on ground in plant areas and in driveways and parking areas outside of buildings should be planned to get the largest uninterrupted area possible during any one pour. Bulkheads at edges of the pour should provide a key to the succeeding pour. Premolded, bituminous expansion joint filler strips should be provided and laid the full depth of the slab where floor slabs butt to vertical masonry construction, such as concrete or brick walls, piers, etc.

ROOF FILL. Lightweight aggregate fill on the roof construction for drainage pitch should be installed where indicated on the drawing, and rough troweled to smooth surfaces in a manner to receive roofing construction.

TESTS. The owner should always reserve the right to inspect or test, or have inspected or tested by outside agencies, any and all of the materials which enter into the concrete work. This inspection or testing normally is paid for by the owner, but the contractor furnishes samples required.

SET ANCHOR BOLTS AND BASE PLATES. The concrete contractor should do all unloading and handling and accurately set anchor bolts and setting plates to the dimensions and elevations shown on the setting plans.

The space under the shimmed setting plates should be filled with a grout poured from one side of the base only, and worked by puddling through to the opposite side without any voids.

Reinforcing bars are furnished bent or straight, as specified on the drawings, and the concrete contractor shall be held responsible for accurately placing them in the locations specified and for thoroughly wiring the bars together at intersections and in the forms in a manner which will hold them firmly in place while the concrete is being poured.

Clips, chairs, or other types of supports for reinforcing steel must be used wherever required by good practice.

All bars at splices must be properly lapped, and the splices must be staggered as much as possible.

Wherever conduits, piping, inserts, sleeves, etc., interfere with the placing of reinforcing steel as called for, the contractor should consult the engineer and discuss method of procedure and secure his approval before pouring any concrete. The bending of bars around openings or sleeves must not be permitted.

WEATHER PROTECTION. According to best practices, concrete work done in freezing weather must be properly protected during and after pouring. Materials used should be heated to a temperature of 50 F or more. Frost-containing or frozen lumpy aggregates are not to be placed in the mixer at any time. No salt should be added to the mixing water. The contractor should not plan to pour when the temperature is at, or forecast to be 25 F or below without approval of the engineer. **End, Part II**

In subsequent articles in this series, the author will continue the specifications that should be written for each of the various mechanical and electrical trades on a construction project.

Report On VW Plant Visit...

And Comments on Editorial Tour of West Germany

By E. B. SKUBIK, Engineering Editor

ON THE AFTERNOON of April 19, 1961 a number of American press representatives arrived in Hamburg for a tour of West Germany which included a visit to the Volkswagen facilities. Arrangements for the tour of several days were made by Volkswagen of America, Inc., of Englewood Cliffs, N. J.

At the airport the visitors separated into two groups according to preassignment; one went immediately to Wolfsburg where the main VW plant is located. The other section to which I was assigned took a roundabout way to this destination.

After an overnight stay in Hamburg, we were taken on a boat trip along the waterways of this major seaport. We went past ships from various parts of the world and saw some tremendous dry-dock facilities. There was also a grim reminder of other days—the collapsed concrete work used for submarine shelter.

We continued our trip from the main rail station of Hamburg where the sleek Trans-European Express (TEE) was boarded for Cologne. The ride in the comfortable accommodations was quite smooth. Rail traffic was heavy with much steam-driven equipment in evidence.

The famous Cologne cathedral is but a short distance from the railroad station. The station was a military target in World War II. Yet this nearby church sustained remarkably little damage. Scaffolding, seen alongside one of the tall towers, was evidence, however, of the repair work that is still being done.

From Cologne we traveled by bus for another overnight stop in Konigswinter, near Bonn. We left the bus in Koblenz on the following day and boarded a Rhine riverboat for Wiesbaden. The river trip was a scenic one with historic castles frequently coming into view on the high banks.

It was evening when we arrived in Wiesbaden; we left this city the

Fig. 1. A small portion of the many units processed daily at the Wolfsburg plant. Newly painted bodies on way to other operations.

Fig. 2. An overhead conveyor line job was in progress at time of our tour. This hydraulically-actuated platform was being put to good use.

next morning for Kassel where we met the other group on their way to the Rhine. Then we proceeded on our way to Wolfsburg.

In Wolfsburg the bus rolled along the Porchestrasse, a wide street with grassy islands between opposing lanes. Along this avenue lies the relatively new and architecturally modern townhall and the many well-stocked stores.

Wolfsburg is a young city with a population of over 60,000. It lies only about eight miles from the East German border. On the north side of this thriving community is the huge Volkswagenwerk. Over 3000 automobiles are shipped out of this plant daily.

City Heating

The city is centrally heated by hot water supplied from the VW power plant. High temperature hot water is delivered from the plant to the city substation (Stadtwerke) at about 16 atmospheres (around 235 psi) and 160 C (320 F). It is pumped out at these conditions for industrial use. A heat transfer system is used to provide water for residential use at 4 atmospheres.

Last winter, heating cost was prorated according to the size of the living area in each residential case. This winter, billing will be by metered calories of heat delivered.

Electric power generated by VW's 11-turbine station is also shared by the city. Current is transmitted at 15,000 v to the same Stadtwerke which receives hot water from the power plant. Industrial substations receive power at the outgoing voltage mentioned; this voltage is reduced to 6000 v for delivery to 48 pole-mounted transformers. From the latter it goes out at 220 v for household use.

Most of the high tension cable is underground with the exception of power lines in an old area. There are about 44 miles of high tension cable in service.

The information on the substation was gleaned from a conversation with Dr. W. Jansen, Leitender Direktor, who spent some time with two other editors and me on Sunday morning. He also escorted us on a tour of the substation.

On the following day we were driven to the Volkswagenwerk. It was in the imposing multi-story building with the king-size version of the familiar VW trademark on top that we came face to face with Professor Heinrich Nordhoff. Under his management, VW's growth has been remarkable and production is expected to hit an annual mark of one million units this year.

From the war-damaged plant, VW operations have been expanded to foreign countries and the West German cities of Kassel and Hannover.

Fig. 3. On the left is Bernhard Heiny, Chief Utilities Engineer; in center is E. B. Skubik, Engineering Editor; at Scoop's left is Karlheinz Dippel, engineer, group supervisor.

Press Lines

Later we toured a portion of the plant, which occupies about 10,000,000 sq ft of the 815-acre site. We went past some press lines incorporating German and American equipment. Production appeared to be moving along smoothly and at a good pace.

In one of the areas there is an unusual merry-go-round setup for spot welding parts of auto bodies. Work rides on a table which is indexed to successive welding positions. After completion of the welding operations, an overhead conveyor automatically picks up the units and carries them away.

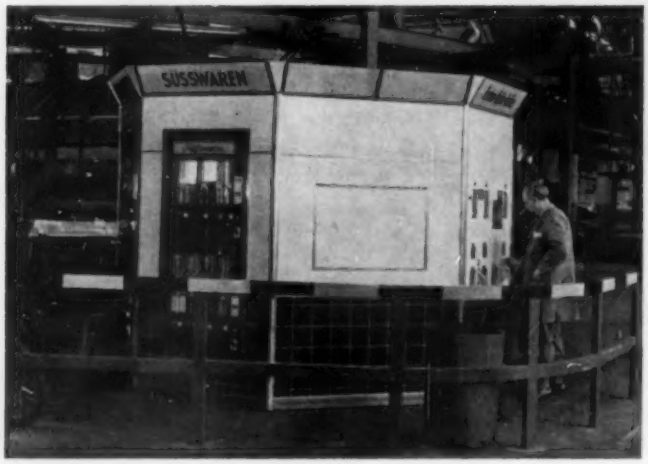
The tour continued through the well-ventilated chrome plating department and past some painting facilities. Incidentally, both spray and electrostatic methods of paint application are employed by VW.

We proceeded to the loading shed where new cars were being driven up a ramp adjoining the end of a string of double-decked railway cars. The vehicles were guided along the top levels of such cars at a surprising rate of speed. This loading method also serves as a "shakedown cruise" for the autos. About 15 trains are

Fig. 4. Worker positioning a typical masonry section of type used in the plant flooring. The powered vehicle near him carried supplies to the job.

Fig. 5. One of the vending islands in the plant. Liquid refreshments and other self-service items are available to the employees at such centers.

Fig. 6. Employee lockers in this area and the wash basin are in the open. Note the individual hot and cold water faucets that are employed.



REPORT ON VW PLANT VISIT

filled in this manner in eight hours.

At the end of their runs the drivers boarded VW buses for a return engagement with other vehicles. The job of securing the autos for shipment was handled by a special crew.

At lunch I had an opportunity to talk with Chief Utilities Engineer, Bernhard Heiny and one of his staff engineers, Karlheinz Dippel. During that time and later in a meeting with both of these gentlemen our conversation was conducted through interpreters.

Mr. Heiny has vast responsibilities in dealing not only with the main plant but all other plants in the VW complex. He has 3000 people under him at the Wolfsburg plant alone, with 1000 of these individuals employed in custodian service alone.

Under his jurisdiction are such utilities as electricity, heat, compressed air, industrial gases, and, of course, water supply. Non-potable water is treated by the plant's water treatment system for plant use. The non-poisonous slime that remains after treatment is put to use on farmlands. Drinking water is pumped to the plant from the Hartz mountains since ground water is brackish.

In addition to the vast plant air handling complex, there are 80 air handling systems for specific areas; because of low summer temperatures less than half of these are equipped with refrigeration compressors. Details of such systems go through the department supervised by Mr. Dippel, who also looks after paint systems and industrial gas facilities.

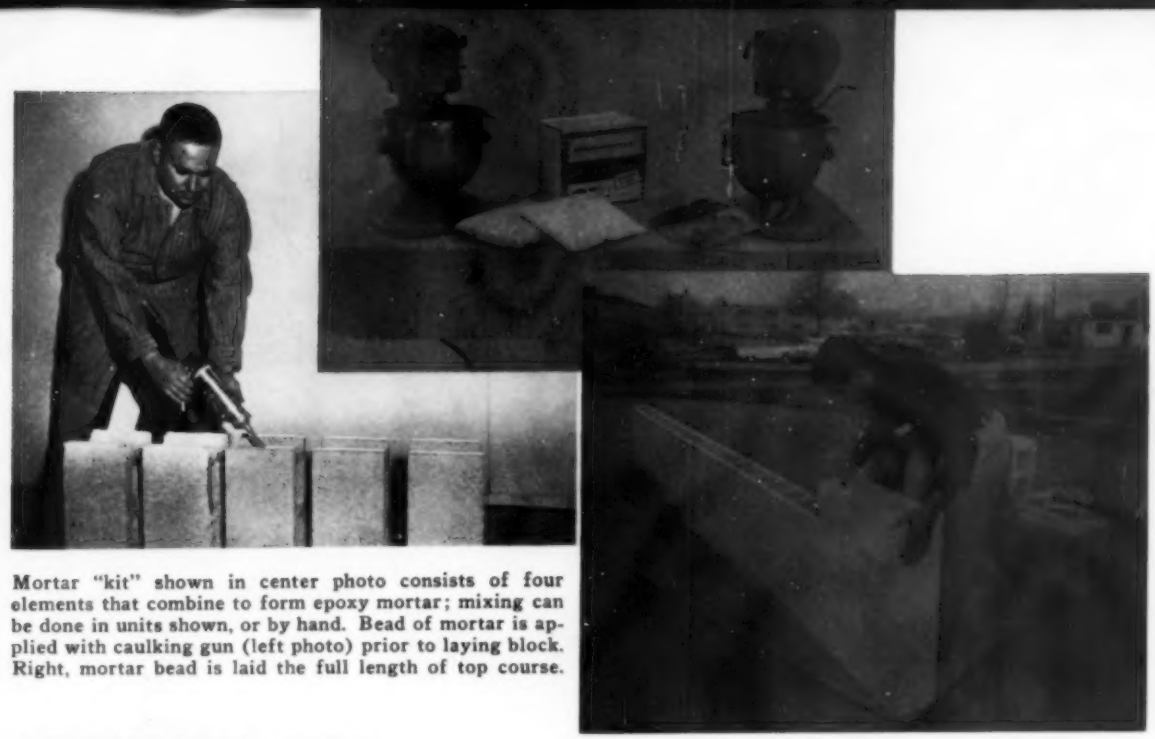
Hundreds of air ducts rise from the plant floor level to a height of approximately 10 ft. Outside air is supplied to such ducts through underfloor shafts; recirculating air enters at floor level through a damper controlled opening. Each of these ducts is equipped with an electrically-driven fan and heating coil. High temperature hot water is used in the heating coils.

Mr. Heiny is also a key figure in the planning and construction of new buildings. Plant safety, highway and industrial vehicles are also of concern to him.

His plant fire department employs eight large trucks. Firemen are on continuous 24-hr duty for 12.5 days of each calendar month. The rest of the time they are on 24-hr call. When on duty they spend a good portion of the time looking after equipment, keeping it in shape for possible emergencies.

After an eventful day at the plant, crammed with a lot of walking, looking, and talking, I proceeded to my hotel by car and finally by foot over one of the pedestrian bridges spanning the Mittelland-Kanal. This waterway joins other West German industrial areas and separates the town proper from Volkswagenwerk.

On the following day, the last of the visit in Germany, we rendezvoused with the other group for lunch in Hamburg and the return trip to New York. **End**



Mortar "kit" shown in center photo consists of four elements that combine to form epoxy mortar; mixing can be done in units shown, or by hand. Bead of mortar is applied with caulking gun (left photo) prior to laying block. Right, mortar bead is laid the full length of top course.

ADHESIVE FOR MASONRY CONSTRUCTION

A NEW DEVELOPMENT in assembling masonry units—the use of adhesives—is exemplified in a new product, Threadline Mortar. It is a mixture of organic and inorganic ingredients which, when combined, make a batch suitable for application to masonry products. It can be used for bonding concrete, cinder, and lightweight blocks, and for bonding concrete, cinder, lightweight and red clay bricks.

This epoxy mortar offers numerous advantages:

1. It can be used efficiently in temperatures lower than ordinary mortar, thus offering additional productive days in many areas.

2. At 70 F, initial cure is reached in 24 hours; full strength in 72 hours.

3. 100 blocks, 8 in. x 8 in. x 16 in., can be laid with one gallon of the mortar.

4. The depth of mortar bed is only $\frac{1}{16}$ in. or less.

The material has a significant limitation—because of its extremely thin mortar bed, its use is restricted to the joining of precision-ground masonry units.

Laying block or brick with the adhesive requires approximately 50 per cent less time than required with mortar. If we regard the masonry cost of a job as 100 per cent, the approximate breakdown for apportioning individual job costs is as follows:

1. 70 per cent of construction cost is for other than materials—profit, labor, equipment.

2. 30 per cent of the masonry cost is in the materials.

With this new mortar, the manufacturer claims that the 70 per cent figure can be cut in half, to reduce building costs approximately one-third.

Designed to reflect the speed with which the new mortar can be laid using concrete block, a time study was made of the erection of two walls; one, using ordinary mortar and the other using the new mortar. The walls were fourteen blocks 8 in. x 8 in. x 16 in. long, plus one half block, 5 courses high. Both mortars were pre-mixed; a three man team worked on each wall.

The following is the time study data:

Threadline Mortar—Time to lay first course—1.7 min.
Total time for all courses—8.8 min.
Final check and cleanup—2.3 min.
Total time required—12.8 min.

Ordinary Mortar—Time to lay first course— 8.3 min.
Total time for all courses—28.1 min.
Pointing, final check and cleanup— 9.2 min.
Total time required—45.6 min.

An example cited by the manufacturer of an actual use of the mortar on a job was an addition to an industrial plant. Bidding on the job of constructing a 60-ft x 140-ft addition to the existing Durable Wire Co. plant in Branford, Conn., the successful contractor was able to bid in at $\frac{1}{3}$ less on the masonry using the new mortar than he would have had to bid using ordinary mortar. The use of the new mortar reduced labor time over 50 per cent, and the job was completed in 11 days.

Specific advantages stated by the manufacturer, Raybestos-Manhattan, are: (1) High strength; (2) Thin joint (waterproof); (3) Fast cure; and (4) Rapid, easy application by trowel or caulking gun.

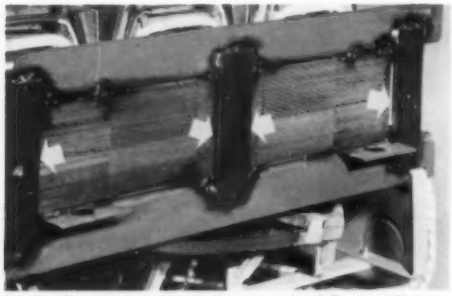
Want More Information?

For further details on this product and its application, write "Threadline" on one of the postage paid cards in this issue, or write to the Editor, Plant Engineering, 308 E. James St., Barrington, Ill.

QHT* dry-type transformers

Research and testing in anechoic chamber of General Electric sound laboratory help maintain low sound levels of QHT transformers.

Built-in vibration-dampening rubber cushions isolate the rugged case of General Electric QHT transformers from core vibration, main source of transformer noise.



Welded steel clamps on higher ratings of General Electric QHT dry-type transformers keep the core laminations firmly in place to minimize vibration and reduce sound.

How General Electric Designs "Quiet" Into QHT Dry-Type Transformers

Choosing the quietest transformer for schools, hospitals, office buildings, and other places where noise could be a problem is now easier than ever. General Electric's new line of QHT dry-type transformers is at least 15 decibels quieter than older designs, and the *actual rating appears on each transformer.* As the chart below shows, each rating of QHT transformers has a sound level equal to or less than the NEMA standard.

Full-time research and testing in General Electric's sound laboratory provide General Electric engineers with information needed to design and maintain the low sound levels of QHT transformers.

Vibration is minimized on larger size units by welded steel clamps which hold the transformer core in a rigid position. In addition, on QHT units rated 30 kva and up, vibration-dampening rubber cushions isolate the case from the core and coil assembly. Consequently, core vibration passing through mounting brackets and conduit to surrounding surfaces is practically eliminated.

QHT transformers also save production space because they offer savings up to 50 percent in weight and 67 percent in size compared with competitive dry-types. You can mount QHT units in out-of-the-way places near the load and save the cost of long, low-voltage feeders.

Installation is fast and easy. You wire QHT transformers from the front. Convenient dual-sized knockouts, large terminal compartments, solderless connectors, and numbered terminals save time.

You can get 24 hour delivery on most models from your nearby General Electric distributor. Call him for more information, or write for GEA-6907A "QHT Specifier's and Buyer's Guide" to Section 411–15, General Electric Co., Schenectady 5, N. Y.

**Registered trademark of General Electric Co., for quiet, high temperature, dry-type transformers.*

KVA	QHT DECIBELS†	NEMA STANDARD
BELOW 5	40	45
5–9	45	45
10–30	45	50
37½–112½	45	55
150	45	60
167	55	60
225–300	55	62
500	60	—

† Measured per NEMA Standard St. 1.411. The average office has sound levels from 55 to 65 decibels.

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GENERAL ELECTRIC

TIPS ON VERTICAL PUMPS

1. What effect does well environment have on maintenance? 2. How significant is a field test? 3. What about power characteristics? 4. How is lubrication handled? 5. What can cause upthrust?

By **WILSON L. DORNAUS**, Senior Engineer, Byron-Jackson Division, Borg-Warner Corporation, Los Angeles, California

Fig. 1. Vertical pump, with submersible motors enclosed in steel casing, is in the process of being lowered into well. Screened intake is above motor.

MODERN CENTRIFUGAL pumps offer the plant operator the widest range of selection and application possibilities industry has ever known. Because of the multiplicity of prime movers and therefore the broad range of speed possibilities, heads and capacities may vary from very low figures to almost astronomical proportions. Limitations arise mainly in the realm of horsepower and space.

A major item for consideration in selecting a pump for any given job is the percentage of time in use. Pumps that need to be turned on and off many times an hour will be sized differently and require certain types of prime movers, in contrast to long term operation for weeks or months without pause.

The system to be established by the pumps will determine to a great extent the slope of the head-capacity curve and the number of units required; flexibility may be of greater importance than efficiency. The total required capacity can be obtained with a variable number of pumps. Economic studies of comparative costs of sizes and numbers of units should be made of pumps as well as pipe, valves, building requirements such as excavation depth and area availability, etc.

Installation can be made more, or less expensive as the need arises to make the equipment weatherproof (indoor) or weather-protected (outdoor). Pumps usually are relatively immune to adverse weather, but some prime movers may not be.

At times it may seem desirable to include all pumping needs in one machine, but consideration of variants in primary or booster requirements may suggest a combination arrangement to give the best efficiency under all conditions of operation, and reduce possible high maintenance costs.

In this regard, high head applications are sometimes hand-in-hand with low initial pressure (suction) and proximity to boiling so that insufficient NPSH (net positive suction head) is available. Unfortunately the natural remedies for this situation decrease the probability of achieving maximum efficiency and minimum cost in a single unit; to ignore the potential dangers intensifies vulnerability of system to early failure.

While it is usually extremely desirable to achieve maximum efficiency, lowest first cost, fewest wearable parts and minimum maintenance all in one pumping unit, it is not sound planning to design for the ultimate in all these fields at once. The item of major importance should be stressed, and other factors brought up to maximum potential without overthrowing the fundamental objective.

Pumps become smaller and cheaper as the speed increases (relatively so, up to limits practical in present day plants), but submergence requirements go up at the same time, and therefore the size of the suction pit (or, we go back to larger impeller eyes and special costs). Simultaneous with increase in speed is decrease in life—shorter terms between overhaul.

In new construction, space may be a problem if the plant site is restricted or soil conditions difficult. Here the vertical pump has distinct advantages, and the wet-pit vertical even more so.

(Turn to page 144)

◀ Circle 569 on postcard, page 33

CHROMALOX ELECTRIC WATER HEATING UNITS

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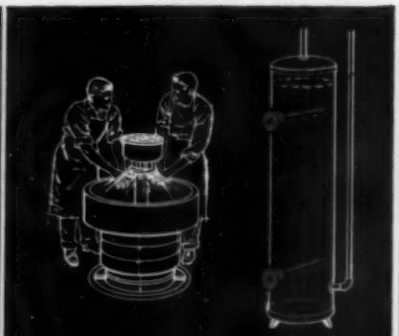
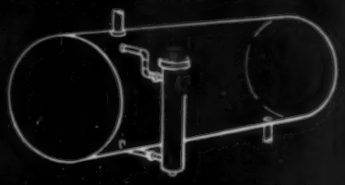


For washroom and shower hot water—Chromalox Electric Heaters are easy to install, safe and economical.



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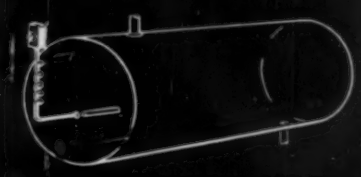

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Circle 570 on postcard, page 33

The ultimate in this regard may well be the "can" type (provides its own suction well) which can also be an in-line booster or supply main pump.

With an old plant and existing facilities the danger lies in attempting to increase plant capacity by an amount greater than the potential of the mechanical parts of the system. Increased wear-susceptibility and shorter over-all lifespan result from stepping up flow velocities past safe normals, and from extending eye and peripheral velocities (past the impeller vanes) beyond the protection of adequate submergence. The long-run economy suggests building additional equipment or to increase the material specifications and inspection take-downs to keep the equipment in top shape.

In the event the liquid pumped is viscous, special consideration in design is called for, and oversizing will be required for both pump and driver. Maximum impeller diameters must not be permitted at the design point (this requirement also applies to pumps with stainless steel cases and impellers).

Pumps for molten metals and salts and for sub-zero cryogenic liquids cannot be taken from standard stock. Specialized engineering knowledge of pumps designed to handle such liquids is not common, and only recognized firms with successful backgrounds along these lines should be consulted for help in plant design.

Designed for Clean Liquids

It must be said that although centrifugal pumps handle solids and dirt in varying amounts and some are actually designed to do so (rock pumps, slurry pumps, cement pumps, fish pumps, sewage pumps, etc.) the great majority of centrifugal pumps are designed for clean liquids to achieve maximum efficiency, long life. Unless the plant process must carry some amount of solid it is preferable to use suitable strainers, trash racks, filters well ahead of the pump suction. If the solid material is abrasive, special materials may be required to minimize wear.

The "Standards of the Hydraulic Institute" contains a substantial list of material suggestions, and for special applications a well-established pump manufacturer should be consulted. The Institute Standards also indicate general application standards for pump selection.

Having a particular process in mind, and having determined the principal pumping requirement (cost, efficiency, utilization, etc.) it is time to call in a pump expert for help. The pump manufacturer has choices of: speed, size, single or multistage, low, medium or high specific speed, open, semi-open, or closed impellers, oil-self or fresh water lubrication, and materials. Choices include various types such as vertical or horizontal, volute or diffuser, two-bearing or overhung, built-on, close-coupled, wet pit, dry pit. These are a few of the variants which give such versatility to the centrifugal pump.

If the plant operator has any preference regarding some of the designs mentioned, they will be given first consideration. However, this should not be at the expense of jeopardizing the success of the installation if other factors carry more weight. For example, it might be required to have the driving motors above flood level for inspection. If this calls for 30 or 40 ft of connecting shafting and tube it may make an awkward installation with a high first cost for pump house and related equipment. A better solution might well be a submersible close-coupled unit, or a river intake (submersible motor on top of single-stage pump) style.

On-and-off booster service is undoubtedly more severe on motors than continuous service. Proper pump selection may reduce the number of starts and stops and give longer motor life.

A wide variation in capacity demand over a period of a few hours or days, or even over an entire season will influence pump selection. A previous article "What Pressures Mean to Pump Operations"—PLANT ENGINEERING, June 1960 discussed this aspect at some length. The need for slow or fast changes in capacity for any variation in pressure can be met by the proper pump if the system design is known.

In this connection it should also be established whether or not it will be required to go below or above the design point by any appreciable amount, since the pump horsepower curve may rise with increase in capacity or it may rise towards a closed-valve point.

The proper selection can be made on the basis of specific speed (N_s). Low N_s pumps (up to about 2500 N_s) have decreasing horsepower when approaching a closed valve (zero gpm) condition. Medium N_s pumps, (about 2500-4500) have substantially flat horsepower curves. High N_s pumps (above 4500-5000) have increasing horsepower approaching a closed-valve condition. Savings in motor cost may be possible by a preliminary study of actual system requirements.

Danger of Cavitation

In this regard it is also quite important to determine how close to actual figures the design head has been established. If safety factors have been introduced at various levels of design, the resultant head required may be appreciably higher on paper than it will actually be in operation. Should this be true, the pump will operate at a much greater capacity than "design", and there will be danger of cavitation due to too little submergence (submergence requirements increase with capacity), and also danger of overloads on the driver with low N_s pumps.

Low first cost may not always be important. Daily power costs on a 10- to 20-year basis may be of more concern to the user. In this case high efficiency is of first importance. The severity of the process (corrosivity of liquid, presence of solids, etc.) may call for special design to improve wear qualities. Any of these features are usually available in a first class centrifugal pump, but not necessarily all at once. For example, a pump especially designed to resist abrasive wear will not be as high in efficiency as it could be otherwise, and certainly will not be the lowest cost pump obtainable for that head and capacity.

Deepwell and submersible pumps may experience trouble from their well environment. Most centrifugal pump troubles occur at the suction end of the pump, and a poor well is bound to give a pump trouble. The well should be properly developed by a test pump after it has been checked for straightness and plumb. It should be free from sand and gas, properly screened, then a pump should be sel-

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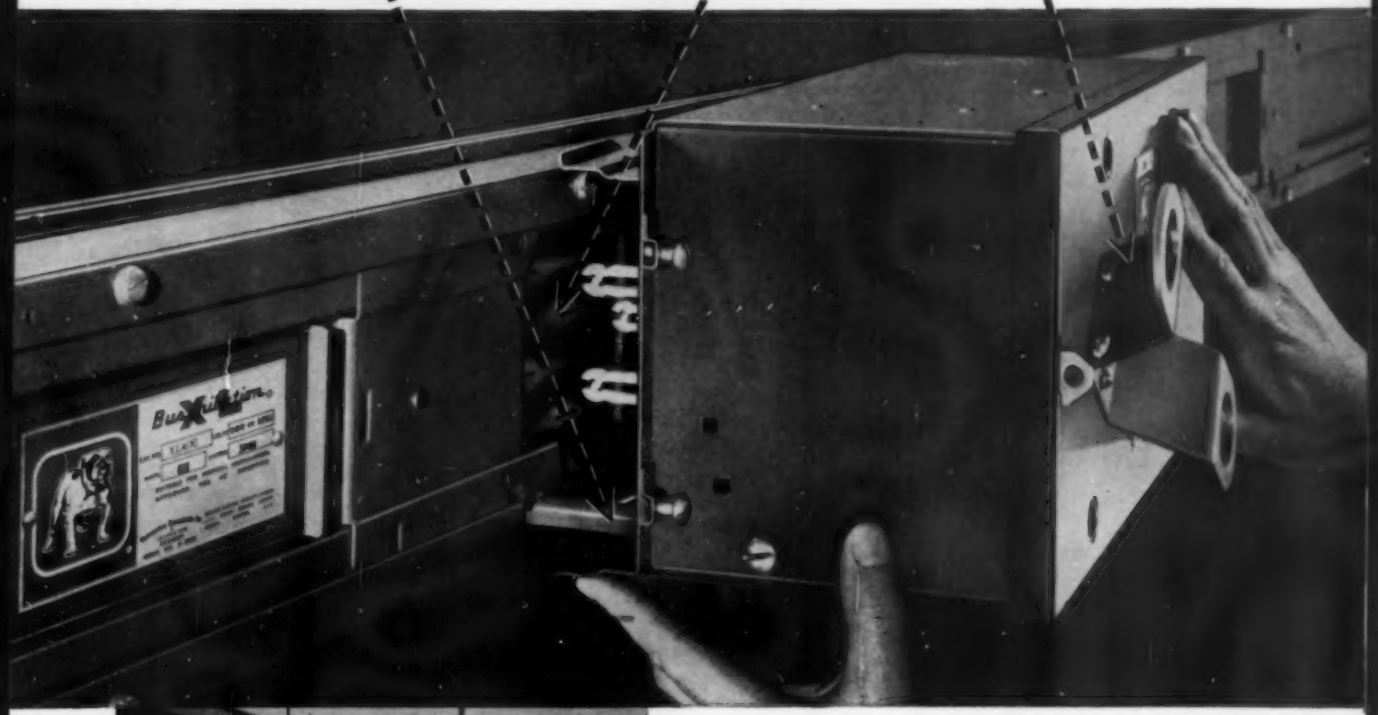

The XL Bus Duct electrical system was designed by BullDog to provide foolproof safety for your people, property and production! The three features shown above assure maximum protection in utilizing electric power distribution throughout your plant.

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BULLDOG ELECTRIC PRODUCTS DIVISION

Circle 571 on postcard, page 33

ected that will not overpump the well's capacity. The unit should be situated to avoid falling water, and have ample submergence. Care taken at this stage will pay dividends later in avoiding pump repairs.

Should any unfavorable well conditions exist, they probably cannot be eliminated by the pump, but careful design can minimize the problems and extend the life of the pump and motor. Pumps selected for unfavorable well conditions will require more frequent maintenance, and this aspect will be discussed later on. Although some sections of the country use closed impellers for sandy conditions, it must be said that semi-open impellers offer a better chance to maintain peak pumping conditions due to the ease of resetting the impellers to compensate for wear.

Field Test

At this point it may be well to discuss briefly the field test of a pump. It has been the practice in some areas to base acceptance of a pump after initial delivery on its field performance. At first thought this would seem to be fair and an ideal arrangement. However, it is a fact that most pumps are not ideally arranged in regard to piping, valves, etc., because of economic compromises, and do not have measuring instruments of laboratory quality and scope, nor are they, as a rule, frequently calibrated. The resultant error in actual recorded values may be greater than an amount acceptable by the buyer's inspector. This becomes an academic problem, especially when it can be compared directly with the laboratory test.

The real value in a field test is in the long range use for periodic comparison of present and future operation. A "duty index" can be established initially when the pump is new to show the relationship between capacity and power consumption. In well pumps this can be established for various drawdown operating levels. A periodic check of this duty index will show the need, if any, for first hand inspection of the pump and motor.

Selection of a well pump should not be completed without reference to power characteristics. The starting requirements for motors are (current-wise) higher than operating, so it is essential to be sure the power sytem can carry the load and the switchgear is adequate.

Pump Torques

Fortunately, pump torques are low at startup and with submersibles reduced voltage starting is seldom necessary. Particularly with this type of pump, the "up-to-speed" time is usually a very few seconds and the system demand is small.

With synchronous motors the total torque curve should be studied in relation to that of the pump to be sure that the unit will pull into step. The proper cable sizing for submersible pumps in relation to the above problems will save future time and money by avoiding maintenance at this very sensitive part of the installation.

Maintenance of pumps and motors should not be considered an unwelcome chore or an unwanted expense, but should be an established program based on the individual consumers system requirement. The pump environment will give an indication of pump maintenance need. Pumps with greater capacity than the well or pit can supply, or those pumping sandy water, or working with air or gas present, or pumping liquids with high or low pH values will require more inspection and repair than those with adequate submergence conditions in clear, cool, air-free neutral water.

Pumps running at cycles regulated by a float-switch or any manual on-off of great frequency will probably have a longer life-period than those operating 24 hrs per day, but the motors will not.

Therefore, it may be seen that the environment and the nature of the service will determine the frequency of maintenance. A period of as little as six months, or as long as five years, may suffice. It is well not to overdo this work. Any inspection period will reveal some wear, but not necessarily enough to warrant parts replacements.

A plant with an available spare which can be rotated among the operating units gives plenty of opportunity for careful inspection, avoids the frantic last minute rush for a spare part that may not actually be needed. Any reputable manufacturer can advise wear dimensions for replacement purposes.

Of a different nature, uneven wear or spotty indications may suggest the beginning of "progressive failure". Any unbalance introduced into the running of a pump will accelerate the original cause of unbalance so that the failure becomes rapidly progressive. If this situation is not corrected at an early stage, the ultimate repair will be unnecessarily costly. This progressive failure may also influence the driver unfavorably.

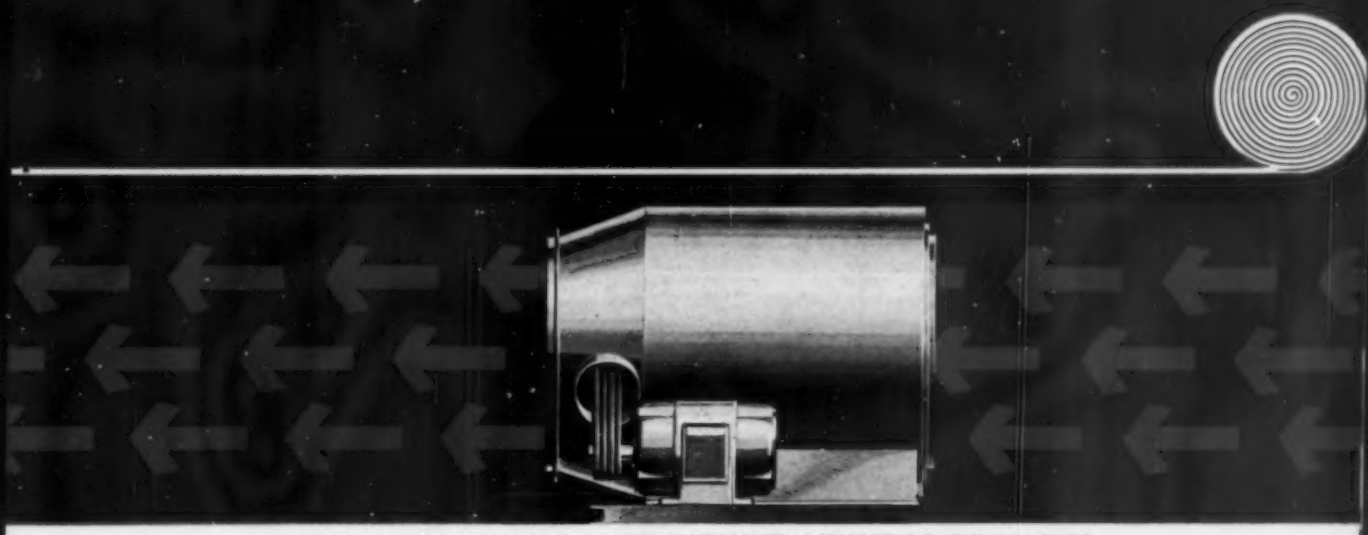
Selection of materials to especially resist corrosion will increase the initial and repair cost of pumping equipment. For this reason it is well to be sure that corrosion is the real problem, and not erosion or cavitation. Different materials would be used to satisfy each of these conditions. The wrong selection would not only be unnecessarily costly but would probably lead to earlier failure because of inproper application.

High Thrust

Requirements for deep settings of well pumps due to falling water tables from area depletion or impervious overlays include consideration of high thrust problems and over-all losses. Hydraulic downthrust can be partially offset by internal pump balancing, but the added static load on shaft type pumps may make total thrust and shaft stretch problems of too great magnitude.

The submersible pump eliminates these problems by avoiding the static load almost entirely since it has no lineshaft. In addition, the absence of a multitude of column bearings and a shaft reduces friction (and horsepower loss) and ultimate maintenance cost. Semi-open impellers can also be used (an impossibility in deep-setting shaft types) for greater efficiency.

A natural asset of good maintenance is proper lubrication. A self-lubricated pump (uses its own pumped liquid for bearing lubrication) is ideal for fairly short settings in clear liquid where the liquid has good lubricating qualities. Settings over 30 to 40 ft require pre-lubrication tanks and may require non-reverse protection. None of these problems occur with a submersible unit. Oil lubrication through inner tubing around the shafting allows



INSTALLATION: S. D. WARREN COMPANY, CUMBERLAND MILLS, MAINE SYSTEM DESIGNER AND BUILDER: J. O. ROSS ENGINEERING, DIVISION OF MIDLAND-ROSS CORP.

Problem: Tight squeeze in a paper mill. Solution: CENTRILINE fans

In an area limited by low headroom, S. D. Warren Company, Cumberland Mills, Maine, solved a critical space problem by installing CENTRILINE® fans under their new coated paper dryer, where conventional centrifugal fans couldn't possibly fit.

Three CENTRILINE fans feed the forced-air drying system in the new machine. These new in-line, Airfoil, centrifugal fans from Westinghouse take up less than half the installed space of conventional centrifugal fans...yet they give comparable performance. J. O. Ross, designers and builders of the equipment, found that under-oven location of the CENTRILINE fans saves floor space...permits less expensive duct runs, easier maintenance, greater accessibility to fan inlet vane controls that regulate air volume. Quiet and efficient operation is assured by a Westinghouse exclusive: the Airfoil bladed centrifugal wheel.

You can save space, cut installation costs and assure quietness with CENTRILINE. Mail coupon now.

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Hyde Park, Boston 36, Mass.

Send me your catalog on the new space-saving Centriline fans.

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J-00717 ® — WESTINGHOUSE TRADEMARK

You can be sure...if it's **Westinghouse**

Circle 572 on postcard, page 33

deeper settings for shaft pumps but involves many more bearings (i.e., *wearing* parts).

The lower end of the shafting in oil lube pumps is actually in an oil-water emulsion, since when the pump is at rest water rises in the tube to the level in the well. For this reason very short settings (15 ft or less) are not too satisfactory with oil lube since the excess pressure of water over oil may actually force water up the oil tube. Again, the submersible does not have this problem.

The most foolproof lubrication for vertical pumps is fresh water under pressure. This can be made to match any existing pump pressure, and can be maintained even when the pump is not running. Depth of setting is no problem, but it is obvious that the submersible unit bypasses the need for this expensive equipment. On the shaft type pump, the extra-long bottom bearing is usually life-packed with a non-soluble graphite grease, and its counterpart in a submersible unit is the top case bearing.

For booster service where the vertical pump may be in a "can" it will help to keep a few pounds suction pressure in the can and keep it vented free of air. If the suction pressure becomes too high the motor bearing may be subject to upthrust. This is not a problem if known beforehand.

There is a minimum limit on the total thrust produced by a pump, and balancing out downthrust increases upthrust so that practical limits for two-pole electric drivers may be reached or exceeded in extreme cases. A four-pole machine will usually handle this situation.

Solid Shaft Motor

By far, the most superior construction for pumps with settings up to 60 ft, and for booster and other close-coupled service is the pump using the solid shaft motor. The initial cost is less than for a hollow shaft, and the adjustment (to set impeller clearance) is at least as simple. Of importance is the more positive bearing support for use in the total shaft system.

Pump stations that must be kept "on the line" in spite of any emergency such as flood, fire, earthquake are well taken care of by submersible units. The standard well type with motor on the bottom of the pump is adequately protected from any contingency except power failure. For river or lake supply with short settings, the "river intake" style with submersible motor on top of pump works down to minimum submergence from any flood condition.

Sometimes a problem is corrected in a pumping application without actually getting to the source of the trouble. A system (consisting of pump, driver, well or pit, and foundation) may experience noise or vibration, which can be corrected by altering any one part of the system but not necessarily the offending part, since the system operates as a unit.

Before pulling the pump or driver to make repairs, it is a good idea to investigate the piping (particularly at the pump connection), valves (should be independently supported), well structure (straightness, drawdown), pit velocity and eddying, power supply and connections, deflection or other inadequacy of foundation, etc.

Performance that does not seem to come up to requirement may be due to inaccurate gages or incorrect power supply. Voltage too far above or below standard will cause irregularities in motor operation and, therefore, in pump performance, or it may be that it is just the gage readings that are off.

As has been pointed out previously, the system demand will influence pump selection to determine the correct number of units and slope of the curve to meet daily or seasonal demands. If this is not worked out properly the addition of extra pumps may not produce the desired results, or the pumps will operate at capacities harmful to pumps or motors. **End**

Fig. 2. Motors on these condensate pumps are located at top of each unit; impellers below bolt flanges at pads.

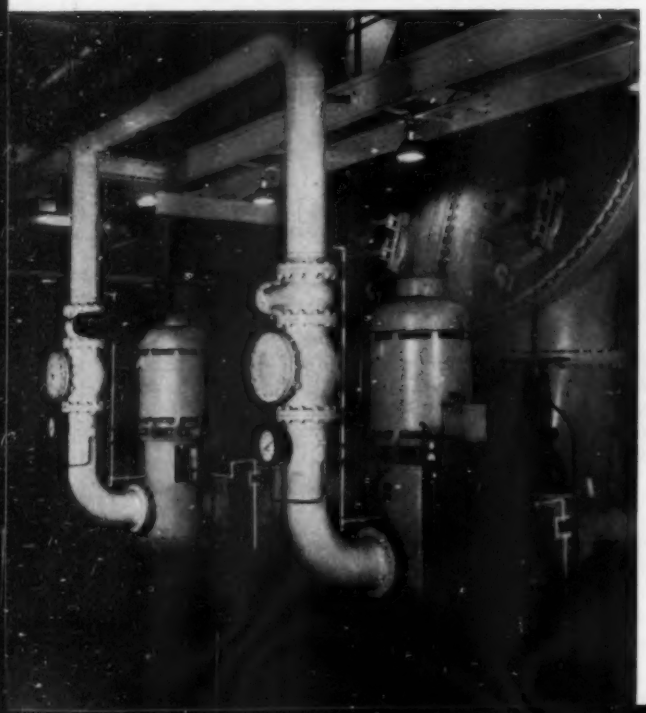
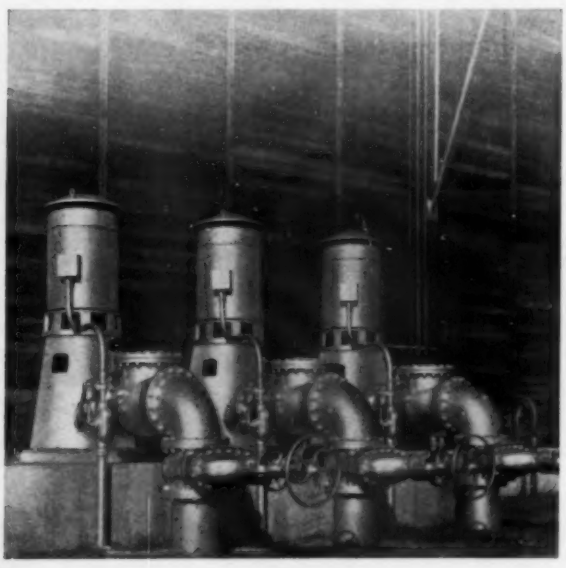


Fig. 3. Group of another type of vertical pumping units utilized to circulate cooling tower water at refinery site.



Now! Best Skilsaw models in 36 years!

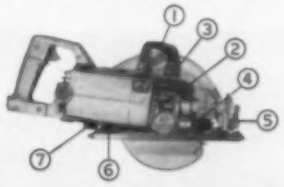
with new "Burnout Protection" motors, backed by full year FREE service policy!

Take it from us—you simply can't afford *not* to use these newest versions of world famous Skil worm-drive saws, they're that much better!

12 major improvements. To start with, we took the finest Skil power saws ever made (the 6½" Model 367, 7¼" Model 77 and 8¼" Model 825) and gave them new B-P motors that give "Burnout Protection" even during frequent, excessive overloads. Next, we made oil level control and oil pressure relief automatic. Then we added a new airflow hood for better cooling, and the convenience of an easier-to-read bevel gauge and a telescoping blade guard that can't bind even on trickiest miter cuts.

The list of improvements goes on and on to make these, unquestionably, the finest saws ever to carry the name "Skilsaw" . . . and that's saying a lot!

Ask your Skil distributor for more information, today. Look under "Tools-Electric" in the Yellow Pages. Or write: Skil Corporation, Dept. 120F, 5033 Elston Avenue, Chicago 30, Illinois.



(1) New plastic-covered top handle for cooler handling. (2) Automatic oil level control. (3) New air flow hood. (4) Push-button blade lock. (5) Easy-to-read bevel gauge. (6) Stronger steel foot. (7) New sawdust ejector system.

SKIL ...and SKILSAW POWER TOOLS

Circle 573 on postcard, page 33

New Plant Brings Automation Into Vitrified Clay Industry

WITH A MANUFACTURING PROCESS closer to complete automation than any other known means for manufacturing clay pipe, the new plant of American Vitrified Products Company, near Somerville, N. J., will have a capacity of 40,000 tons of pipe a year. It uses fully and partially automated equipment which has already raised operating efficiency over 50 per cent and cut manufacturing costs substantially.

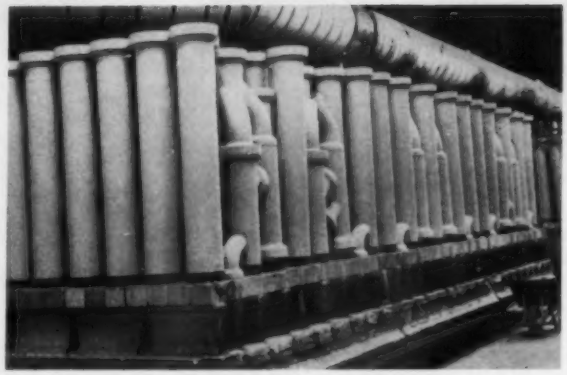
Clay and shale are automatically blended in a precise formula, premixed, then released to a conveyor-belt system which transfers the mixture to the automatic extrusion machines, where an automatic auger drives the material through a sized, forming die.

The pipe is automatically cut to specified length as it emerges from the extruder. It is then finished, stamped and rolled onto an automatic palletizing machine which stands the pipe upright and properly spaces it on a pallet for handling during curing.

Pallets are then removed by a lift truck and placed on an automatic pusher which drives them continuously through drying ovens.

Pallets of dry pipe are then placed in temporary storage, or taken to a glazing pit. Glazed pipe are set on individual rings by an air-hoist system and positioned semi-automatically on 10 ft by 10 ft kiln cars. The cars, moving in a continuous line, pass through a preheated drying area and eventually enter the tunnel kiln for firing.

The firing zones are adjusted to fit the material. They consist of: 1. A preheat zone of gradually increasing intensity to prepare the pipe for burning and bring the inside of the walls to the humidity level of the outside and inside surfaces; 2. A hot zone in which the pipe is uniformly fired; 3. A cooling zone in which palletized pipe are prepared for removal from the kiln.



The cars pass individually from the kiln and are transferred to a palletizing area where the pipe is removed, palletized and placed in the joint department.

A special adhesive is then placed on the pipes; they are picked up by an air hoist and hung on an overhead conveyor system. Dies are inserted at both the bell and spigot ends of the pipe and the conveyor takes its continuous load through yet another preheat zone to an areas where each pipe is centered in the dies, and plastisol is applied with special pressurized guns into both dies. This provides the joint application.

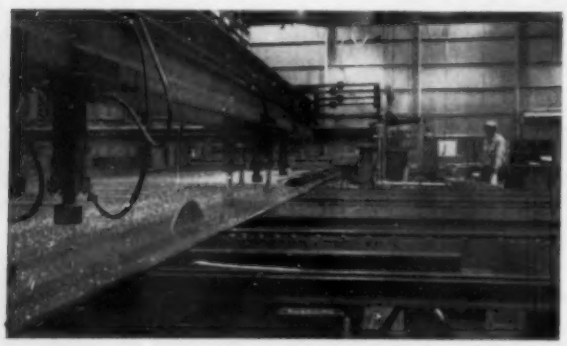
The conveyor then carries the pipe into a curing zone at a predetermined rate of speed. In a subsequent cooling zone the dies are removed, leaving the plastisol joint intact at either end. The pipe, now ready for field installation, is then placed on pallets for storage or shipment.

Rip, Crosscut and End Trim Saws "Gang Up" on Aluminum Plate

NOW IN FULL PRODUCTION at Kaiser Aluminum and Chemical Corporation's Ravenswood Works in West Virginia, a highly automated circular sawing machine for aluminum alloy plates can handle material up to 64 ft long by 14 ft wide by 6 in. thick.

The entire sawing facility, designed and built by Loma Machine Manufacturing Co., Inc., comprises a 64-ft travel rip saw, a 14-ft travel crosscut saw and a 14-ft travel end trim saw, all integrated to facilitate simultaneous operations.

The plate handling equipment comprises a charging table for entering the stock into the rip saw, a delivery table for removing the stock from the rip saw into the crosscut or end trim saws, and a runout table for discharging the finished plates. In operation, each plate is loaded by crane onto the charging table receiving racks which are clad with Micarta. The plate is moved into the rip saw path by an automatic pusher drive which cuts out as soon as a series of stops on the delivery table are hit.



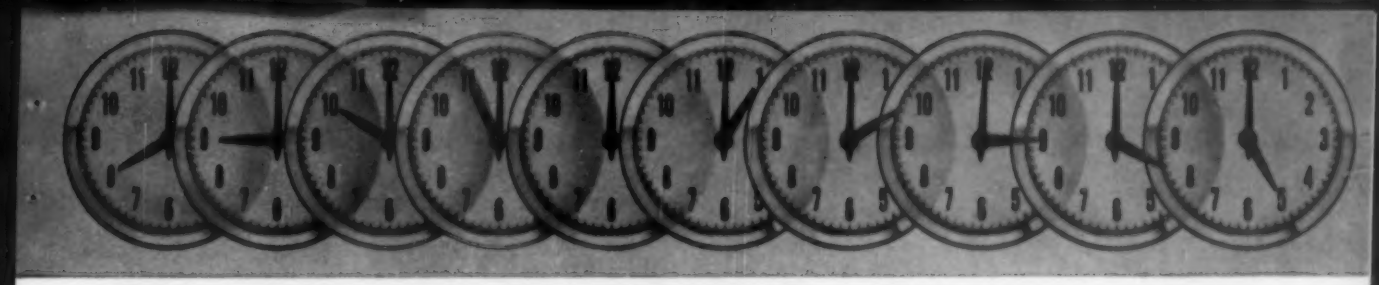
Then, air-operated hold-down clamps located on both sides of the saw path are lowered, the length stops in the table disappear, the air-oil mist lubrication system is turned on, and the rip saw begins to make its cut.

The 64-ft-long rip saw employs a 30-in. diameter carbide-tipped sawblade driven by a 60-hp motor at a peripheral speed of 12,000 ft per minute. The crosscut and end trim saws are all similarly designed, except that their length of cut is only 14 ft.

Once the rip saw cut has been completed, the hold-down clamps open and the cut plate is moved out of the saw path by a set of belt conveyors. Subsequently, it is transferred by means of the reversible delivery table rollers, to be similarly cut by the crosscut and/or the end trim saws.

Finally, the trimmed plate is moved onto a runout table, which is equipped with driven transfer rollers. It is now ready for crane pickup, to be transferred to the shipping or heat treating bay.

Circle 574 on postcard, page 33 ➔



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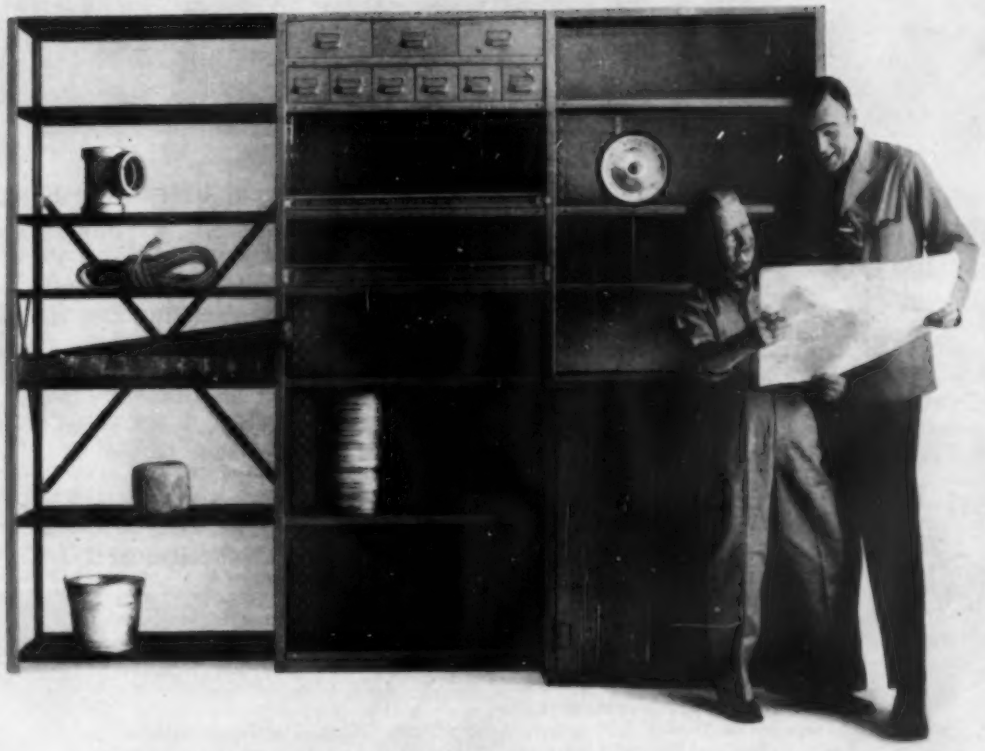


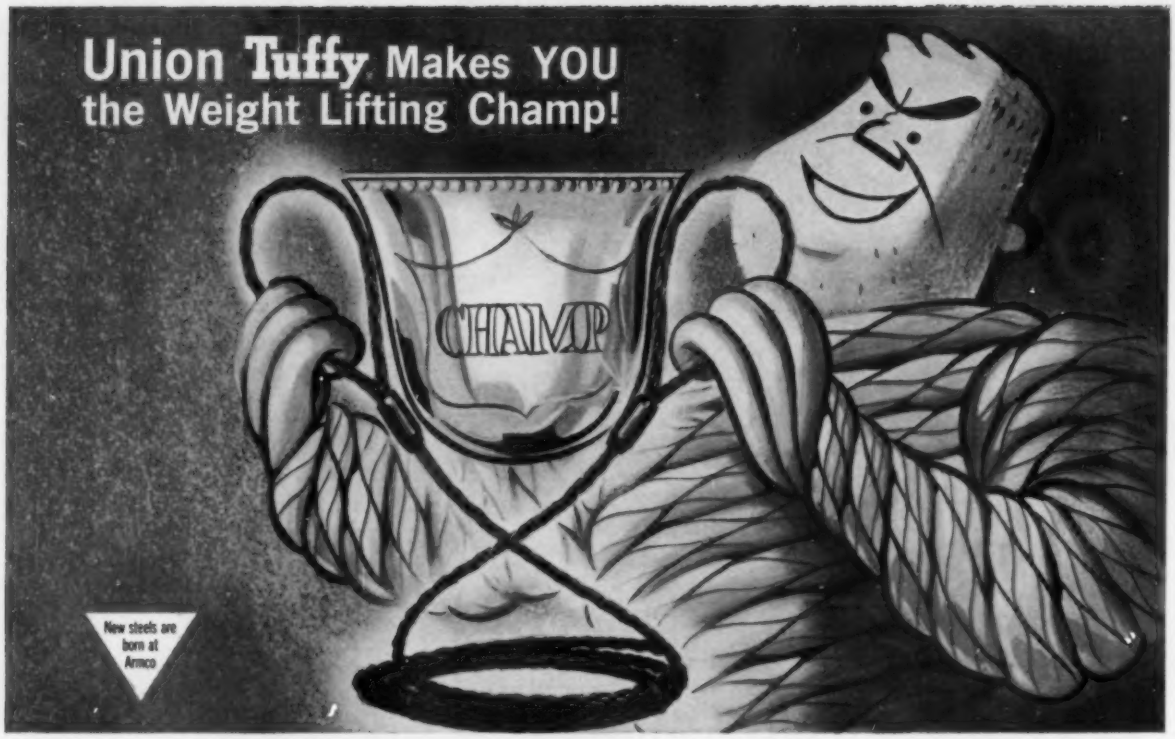
GET THE PROFESSIONAL DELUXE SOLUTION

ble line of steel shelving and accessories. There are more possibilities! Like to **see** a solution to your storage problem **before** you spend a penny? No obligation, of course. Call or write: DeLuxe Metal Products Company Division, Royal Metal Manufacturing Company, Dept. 21-F, One Park Ave., New York 16, N. Y. SHOWROOMS: New York, Chicago, Los Angeles, San Francisco, Seattle; Galt, Ont.

DELUXE

Circle 575 on postcard, page 33

Union Tuffy Makes YOU the Weight Lifting Champ!



Hercules, Paul Bunyan, Big John Henry—pick any strong man you like, real or legendary. You and Union Tuffy can outlift him and never strain a muscle. You see, Union Tuffy slings have sinews of braided steel. Machine-braided wire fabric construction, a Union Tuffy exclusive, gives you great flexibility for safer, easier handling and resistance to kinking. Even if a Tuffy Sling gets a kink, it's quickly taken out without material damage to the wire fabric. Specify, yes insist, on the balanced power of Union Tuffy Slings and Union Wire Rope Tuffy Hoist Lines.

More Special Union Wire Slings

In addition to famed Union Tuffy Slings, Union Wire Rope offers, in a full range of sizes:

1. **Hand Braided** six and eight-part slings.
2. **Uni-ply**—a flexible multi-part rope laid sling with pressed-on metal ferrule.
3. **Press-Grip** wire rope sling with pressed-on metal ferrule.
4. **Uni-Grip** wire rope sling with return loop splice and pressed-on metal ferrule.

Union Wire Rope Tuffy Tips on safe use of Slings and Hoists

Professional Weight Lifters Work the Safety Angles

Here's a tip that could save an injury and absenteeism. The weight lifter's secret is proper leverage. The weight lifter never leans over to pick up the load. He squats down as near as possible to it, and keeps his back erect. Lifting action comes from legs and thighs. If you must use muscle for lighter lifting jobs, these points are worth remembering. But wherever possible — and always for heavy loads—use hoists and slings.

Free! Two Valuable Tuffy Handbooks

1. "Tuffy Tips." Many more safety hints. Tells how to break in wire ropes and slings; lubrication and inspection procedures. Do's and don't's to save money, assure better service.

2. "Tuffy Sling Handbook." Helpful data on the selection of slings for different jobs—types, dimensions, weights, fittings, rated loads, safety-approved signals.

3-61

BOTH FREE! Write Union Wire Rope, Armco Steel Corporation, 2272 Manchester Ave., Kansas City 26, Missouri

ARMCO Union Wire Rope

Circle 576 on postcard, page 33

with
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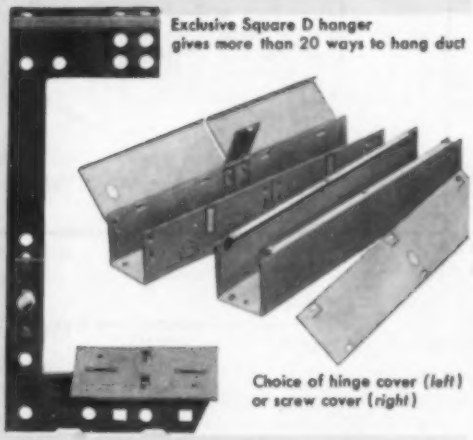
you can---

INSTALL WIREWAYS FASTER AND AT MUCH LESS COST!

Before you decide to install conduit on a job, check to see if you shouldn't be using *Lay-in Duct* instead. Experience shows that in 1 out of 7 cases, the job can be done faster and at substantially less cost with *Lay-in Duct.*

Not only that, but *Lay-in Duct* makes it easy to add extra circuits later on, makes machinery circuits readily accessible, makes it simple to modify layouts. *Lay-in Duct* is completely reusable, requires less labor on multiple circuits.

You get extra advantages when you use SQUARE D *Lay-in Duct.* You can choose from two types—hinged cover or screw cover—and from the most complete line of fittings available. All fittings can be used with either type. You get the fastest installation—quick couplings. The exclusive Square D hanger gives exceptional flexibility—provides more than 20 ways to hang Square D wireways. You get real rigidity, too—joint design triples duct strength. Available in four sizes—2¼, 4, 6 and 8 inches.



Exclusive Square D hanger gives more than 20 ways to hang duct

Choice of hinge cover (*left*) or screw cover (*right*)

Write for Lay-in Duct literature. Address Square D Company, 1601 Mercer Road, Lexington, Kentucky

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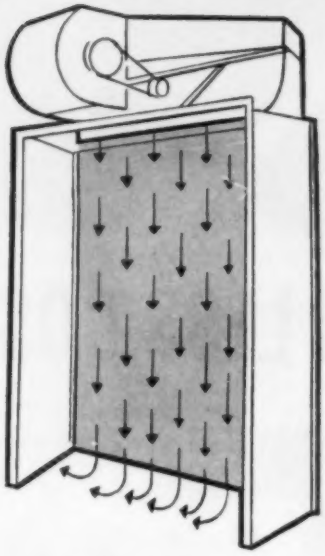
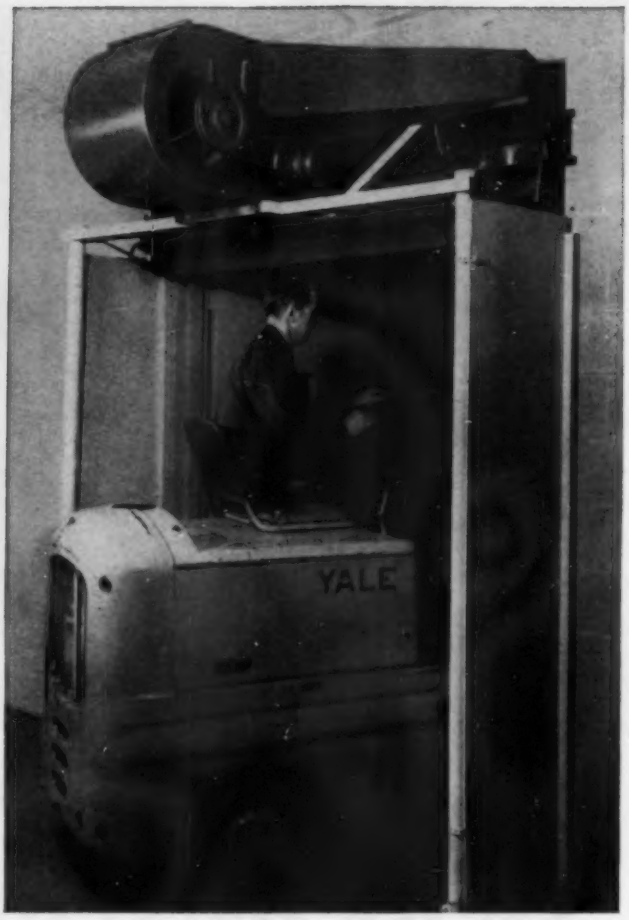
Circle 577 on postcard, page 33

AIR ISOLATOR*

***opens** doorways to unlimited traffic*



Air Isolator is available for openings up to 8′ wide, 10′ high.



Traffic speeds through "open" door as Air Isolator immobilizes movement of air between the two areas.

***screens out** heat, cold, humidity, dust, odors, insects*

• AIR ISOLATOR is the proven and practical answer to high volume traffic problems between two areas of different temperature or humidity.

AIR ISOLATOR provides a high velocity curtain of vertical air across open doorways to form a shield between outside and inside air. During periods of heavy traffic, doors can be opened and left open. Traffic moves faster; dust, cold, heat, odors or insects are repelled; worker comfort is assured.

* registered trademark and product of Lehigh, Inc.

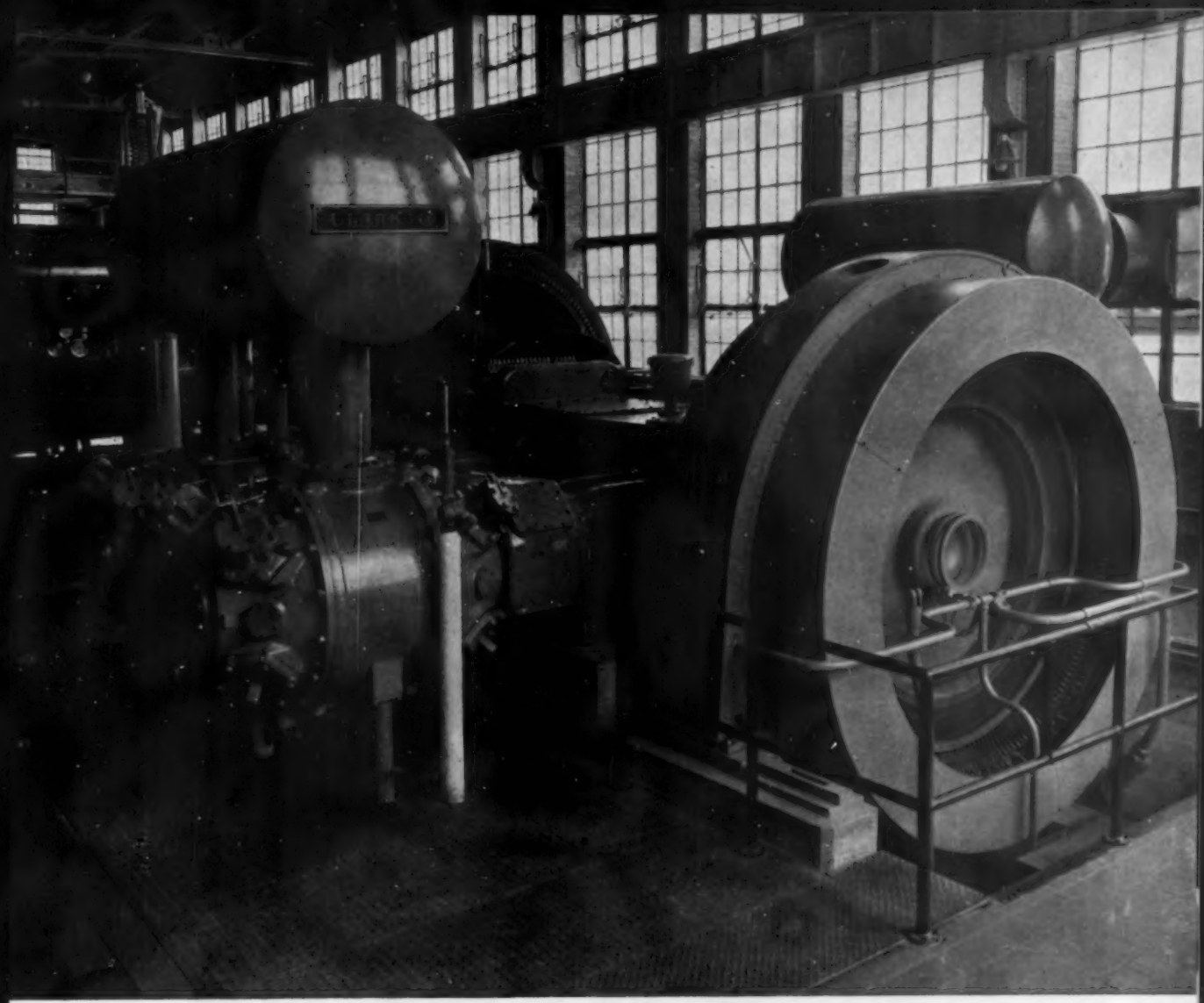
WRITE FOR INFORMATION

Complete data on the economical Air Isolator is yours for the asking. Write today to Jamison Cold Storage Door Co., Hagerstown, Md.

JAMISON
COLD STORAGE DOORS

Circle 578 on postcard, page 33

Circle 579 on postcard, page 33 →



Clark Air Compressor Keeps Lid On Maintenance!

Just Plain Dependable—That's the only way to describe this 2000 bhp Clark CBA-4 Balanced/Opposed Compressor. Ten years ago it was installed in the assembly plant of a major Detroit automotive manufacturer. To date, there has been no forced downtime other than scheduled maintenance overhauls.

On Duty 16 Hours a Day, five days a week, the compressor operates as a base load machine supplying 10,000 cfm of air at 105 psi. This is rated at 8% of total plant air utilized to operate the assembly line, paint shops, glass plant, blast furnaces and other functions.

Under a Preventive Maintenance Program, the compressor is overhauled once every two years. After 10 years of service, the valves are still original equipment. Bearings are also original equipment and have required no maintenance since startup.

Besides this Trouble-Free Performance, the user is on the "plus" side in many other respects. Among them: Smooth operation achieved by Clark Balanced/Opposed design; compactness that saves floorspace; simplified, reduced foundation requirements; inherent accessibility; marked simplicity of design.

Covering a Range of 75-8000 BHP, the Clark Balanced/Opposed, Motor-Driven line is increasingly becoming industry's preference for plant air requirements. Complete details are obtainable in Bulletin 185. Write now for your copy or get the facts first hand from your nearest Clark representative.

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OIL • GAS • CHEMICAL
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- Measures speeds to 25,000 rpm directly; useful to 250,000 rpm.
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Circle 580 on postcard, page 33

Circle 581 on postcard, page 33 ➔

You get more value for the same dollar– in the NEW Bulletin 709 line of starters!

SIZE 00

SIZE 5

This new line of Allen-Bradley motor control will change every idea you have had about starter size, performance, and life. The small size—especially in the higher ratings—is startling. Yet rating for rating the operating life and reliability have been increased many times. Built into each of the seven sizes of this new Allen-Bradley line is an ability to interrupt tremendous currents and to operate year in and year out for many millions of operations without trouble or maintenance.

The new Bulletin 709 starters are just as advanced in appearance as they are in performance. All seven sizes have an aristocratic styling and a distinctive family likeness. Brooks Stevens, famous industrial designer, has given the enclosures such an attractive, modern style that these new starters will prove a distinct sales asset on any machine or installation.

Why not write today for more information on this revolutionary new line of Allen-Bradley Bulletin 709 *quality* across-the-line motor starters?

Note the compactness of both the smallest and largest starter in the new Bulletin 709 line. Ratings up to 100 hp, 220 v; 200 hp, 440-550 v.

10-61-RM

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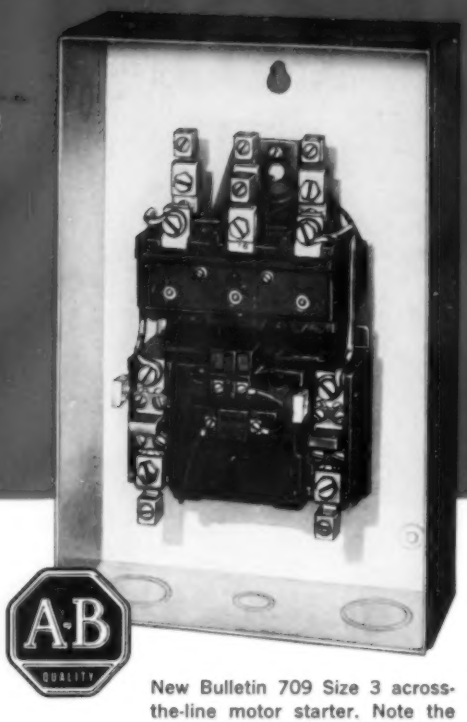
Member of NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

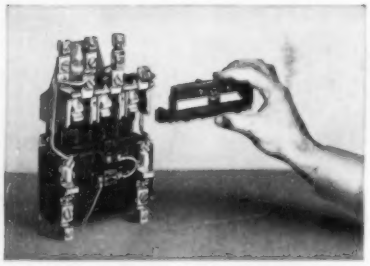
QUALITY MOTOR CONTROL

Features of the NEW Allen-Bradley starter line that are of value to you!

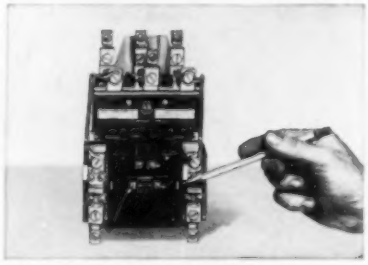


New Bulletin 709 Size 3 across-the-line motor starter. Note the generous space for wiring, accessible terminals, and white interior.

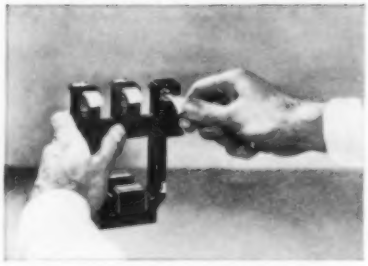
Every detail of the new Allen-Bradley motor starters has been designed to help make this the best line of motor control on the market. Remarkably small in size, each starter is a giant in performance. Being light in weight, these starters are easy to handle and a cinch to install. The generous wiring space, full front wiring, white interiors, and convenient knockouts make installation easy. The enclosure cover is firmly held with a quarter-turn fastener. All installation, inspection, and maintenance operations can be handled from the front—as shown in the illustrations below—without the use of special tools.



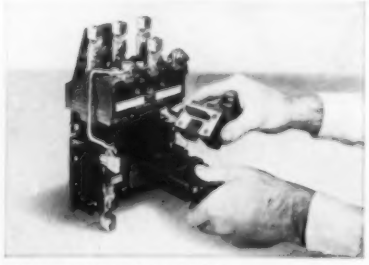
QUICK, EASY CONTACT INSPECTION—When the arc hood front cover is removed by loosening two captive screws, contacts are plainly visible from the front.



CONTACT POSITION INDICATED—Two slots in the coil cover show the position of the movable contact support—tell whether contacts are "closed" or "open."

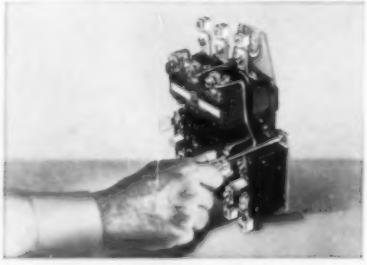


CONTACTS EASILY REPLACED—Depress the spring slightly, and the movable contacts can be lifted out of the molded support and the new contacts slipped in.



COIL EASILY CHANGED—When the coil cover is removed, coil and magnet yoke can be lifted out from the front. They are impossible to replace incorrectly.

AUXILIARY CONTACTS EASILY ADDED to the front of the starter. Two extra auxiliaries can be added to Sizes 0, 1, and 2 starters, and four, to Sizes 3, 4, and 5.



A THIRD OVERLOAD RELAY CAN BE EASILY ADDED in the field, from the front of the starter. And the only tool needed is a common screwdriver.

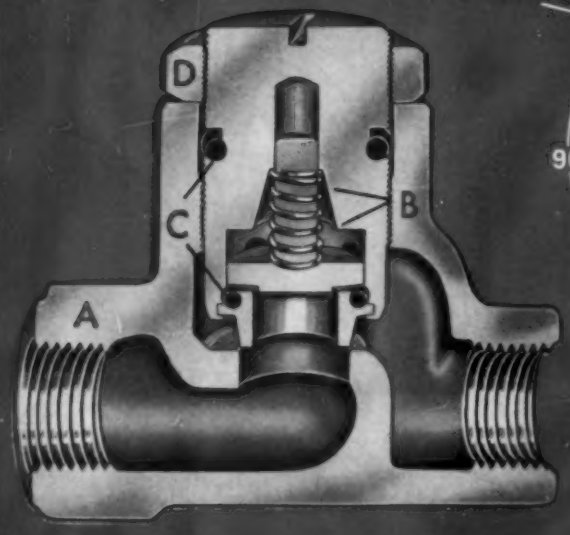
ALLEN-BRADLEY

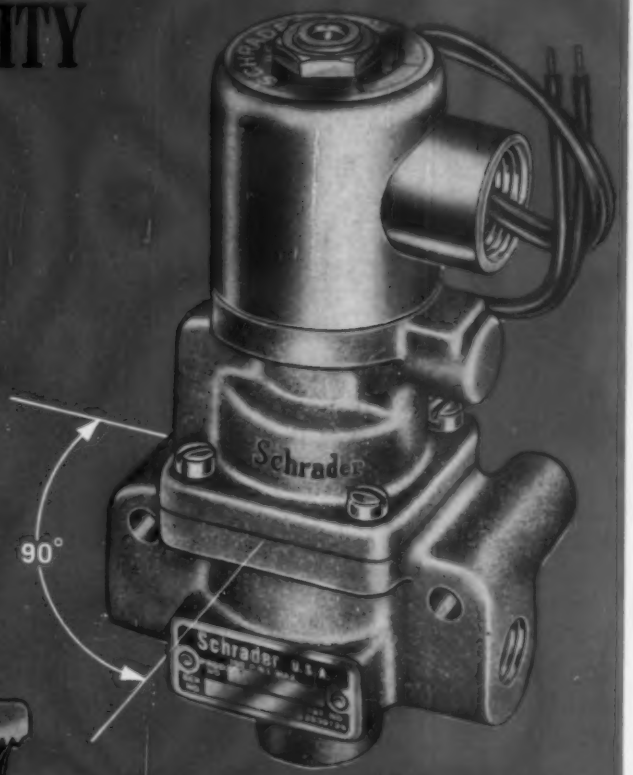
Member of NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

QUALITY MOTOR CONTROL

THERE'S A QUALITY DIFFERENCE IN AIR CONTROL COMPONENTS...





...you can see the difference in any Schrader Air Product

FOR EXAMPLE: Schrader Flow Control Valves—a unique combination of a poppet by-pass valve and a large "cone seat" metering valve provides full air flow in one direction and carefully controlled flow in the other. (A) Body of cast brass. (B) Compact plunger assembly replaceable in one unit. (C) "O" ring seal for surest airtight performance. (D) Extra-fine screw thread adjustment for vernier-like setting and sturdy lock-nut to hold adjustment even under rough treatment.

ANOTHER EXAMPLE: Solenoid-operated 3-way Valves by Schrader permit electric control of air power and make possible new versatility and compactness in automation and machine design. Typical feature . . . by shifting pilot chamber head 90° a normally-open type may be changed to normally-closed, and vice versa. This poppet type valve, has a self-cleaning seat and provides full air flow assuring optimum characteristics for cyclic operations. Available in five pipe sizes from ¼" to 1".

FULL LINE OF QUALITY AIR CIRCUIT COMPONENTS • OFF-THE-SHELF SERVICE AND INFORMATION FROM YOUR NEARBY DISTRIBUTOR • STAFFED WITH AIR CIRCUIT EXPERTS • CONSULT YELLOW PAGES OR WRITE FOR HIS ADDRESS

A. SCHRADER'S SON
Division of Scovill Manufacturing Co., Inc.
484 Vanderbilt Ave., Brooklyn 38, N. Y.

Schrader®
a division of SCOVILL
QUALITY AIR CONTROL PRODUCTS

Circle 582 on postcard, page 33

First from General Electric (1959)... another bright idea that became a better lamp for you... Quartzline lamp

packs more light in less space than any other filament lamp

Listen to the nearsighted Mister Magoo . . . "1959? Seems like last week! I volunteered but the authorities picked seven other Astronauts—and General Electric invented the Quartzline lamp. Happy birthday, Quartzline. Tarnation! This confounded pen won't write!"

Understandable mistake, Mister Magoo. The 5-inch, 500-watt Quartzline *is* no bigger than a pen. But it's 19% more efficient than a regular lamp, never grows dim, and gives you better light control than any earlier lamp.

Every Quartzline lamp stays almost 100% bright throughout its life—because General Electric engineering leadership found a way to keep tungsten vapor from blackening the glass. G.E. puts iodine gas in the lamp to catch the particles evaporating from the tungsten filament. Miraculously, the iodine re-deposits them, over and over again, on the steadily-bright filament. This process makes the 5-inch Quartzline last 2000 hours, twice as long as a regular bulb-shaped lamp.

Use Quartzline with the right reflector, and it'll give you a precise, powerful, rectangular beam of light in one direction—as narrow as 6° or as wide as 100°. No elaborate lens system is needed.

Or take the big-brother model, the 10-inch, 1500-watt Quartzline. It's *50% more efficient* throughout its life than a standard 1500-watter of comparable voltage.

Applications? Stadiums. Airport runways. Building facades. Show windows. Inspection or outdoor work areas. Don't worry about rain and snow. Quartzline resists thermal shock.

Ask your G-E distributor for more information on Quartzline lamps—small proof of General Electric lighting leadership! General Electric Co., Large Lamp Dept. C-110, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Circle 583 on postcard, page 33

Six hands on six buttons... safeguarded by Clark Anti-Repeat Press Controls... as used in the Cleveland Stamping Plant of the Ford Motor Company... one of more than 300 Clark-controlled presses in this modern plant.

How to make your presses most considerate of MEN, MACHINES and MONEY

It's just a little short of amazing what a difference the right press controls can make. Clark Press Controls, for instance, are designed to guard against every conceivable unsafe condition, while assuring maximum production.

Benefits reported by our customers after standardizing on Clark Press Controls include:

- *Fewer accidents, resulting in lower industrial insurance rates.*
- *Greater protection against damage to expensive presses and dies.*
- *Substantial reduction in costly downtime.*

Today, there are more than 20,000 of our press controls in operation throughout industry. In automotive plants, Clark Press Controls outnumber those of all other manufacturers combined. Good reason to talk to Clark about *your* press control requirements... to call the nearest Clark sales office, or write:

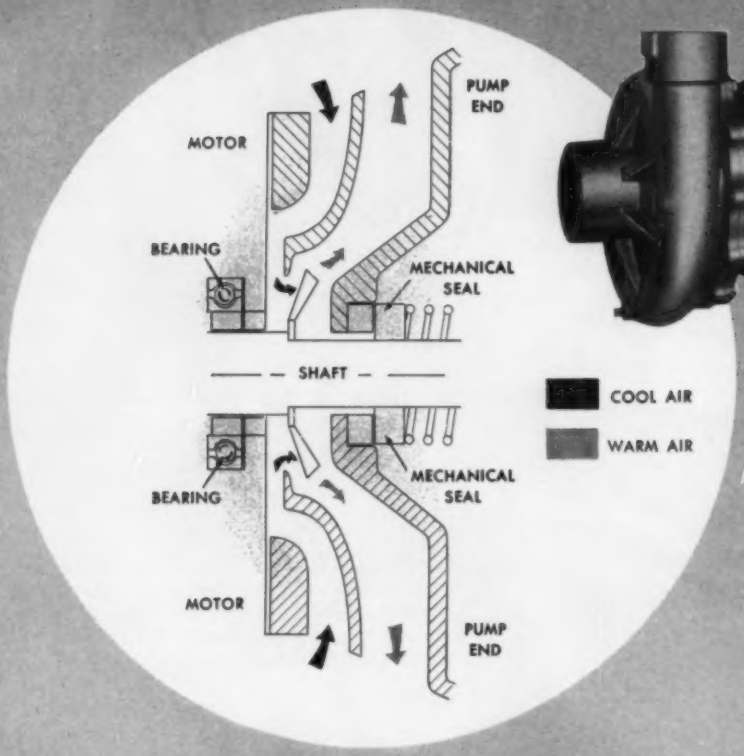
61PC1

THE CLARK CONTROLLER COMPANY

MAIN PLANT: CLEVELAND, 10 • WESTERN PLANT: LOS ANGELES, 58
IN CANADA: CANADIAN CONTROLLERS, LIMITED, TORONTO, ONT.

Circle 584 on postcard, page 33

NEW DUNHAM-BUSH A9 CENTRIFUGAL PUMPS PROVIDE 2-WAY PROTECTION AT DANGER ZONE



EXCLUSIVE SLINGER DESIGN

Fanlike action draws in air through special ports in head and exhausts air moisture through additional ports. Water is rapidly removed if seal is worn, protecting motor bearings. It also cools seal, affording longlasting, efficient operation.

Now Dunham-Bush offers a complete line of close coupled centrifugal A5 and A9 pumps for far reaching applications.

The new heavy duty, quality A9 pump expands the Dunham-Bush centrifugal pump line to 51 size standard models . . . 1750 or 3450 RPM, high capacity and head . . . plus non-standard pumps with special impellers.

Dunham-Bush A9 pumps contain built-in safety factors comparable to that of the pipe and fittings; components designed for heavy duty use; seals for temperatures up to 250°; case held to head with 12 bolts; discharge connection that can be rotated to 12 different positions.

Get full details of the sensational new Dunham-Bush A9 and A5 pumps. Request bulletins 1440A and 1442.

Dunham-Bush, Inc.

WEST HARTFORD 10 • CONNECTICUT • U. S. A.

DUNHAM-BUSH

AIR CONDITIONING • REFRIGERATION • HEATING • HEAT TRANSFER

WEST HARTFORD, CONNECTICUT • MICHIGAN CITY, INDIANA
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heat x HEAT-X, INC., BROWNTOWN, N.Y. DUNHAM-BUSH DUNHAM-BUSH (CANADA), LTD., TORONTO, CANADA
DUNHAM-BUSH DUNHAM-BUSH, LTD., PORTSMOUTH, ENGLAND SOUTHERN SOUTHERN CORPORATION (CANADA) LTD., PORT HOPE, ONTARIO

Circle 585 on postcard, page 33

The Sign of a Real Bargain in an IRON BODY GATE

Cost-Per-Year is Lower... Initial Cost no Higher

For generations extra-quality, extra-stamina Jenkins Iron Body Gates were regarded as the best buy for the money . . . even though they cost more to buy. Lower maintenance expense and extra years of service more than offset any price differential.

Today, these widely favored valves are an even bigger bargain in true value. *You pay no more for them at the start!* And you get exactly the same high quality and perfection of design for your money.

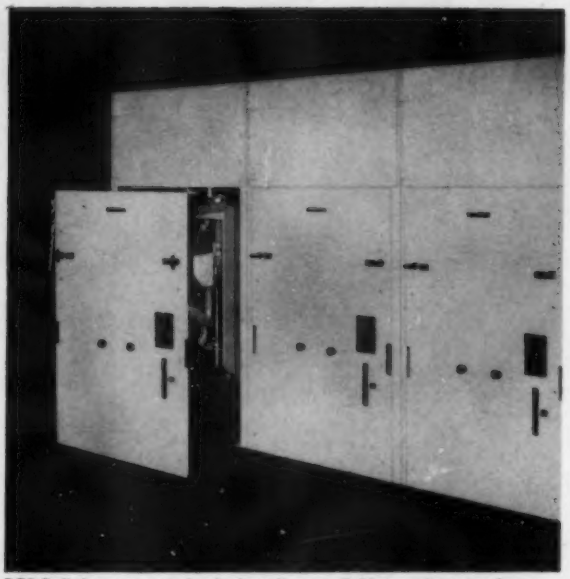
You can satisfy all your needs from the complete line of Jenkins Iron Body Valves. Jenkins Bros., 100 Park Avenue, New York 17.

AVAILABLE FROM LEADING DISTRIBUTORS EVERYWHERE

JENKINS
MOST TRUSTED TRADEMARK IN THE VALVE WORLD
VALVES
JENKINS SINCE 1864
Jenkins Bros

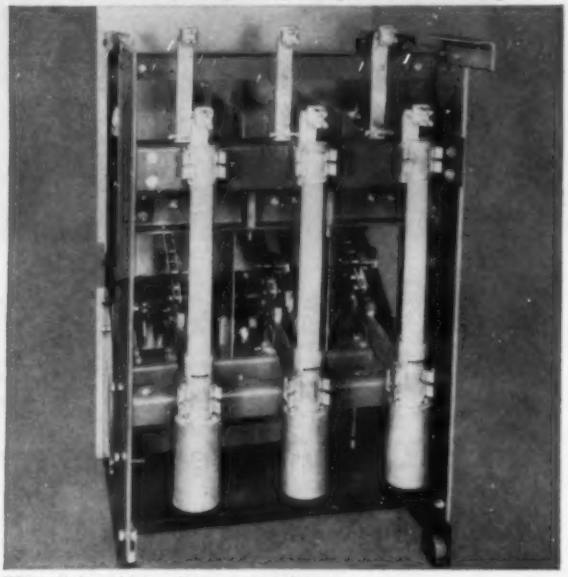
Circle 586 on postcard, page 33

New...Low-Cost, Drawout DFS Metal-Enclosed Load-Interrupter Switchgear



DFS Switchgear comes in single units or switching centers, as shown, for service entrances, transformer primary or feeder switching.

DFS drawout switch and fuse element is easily levered into cell.



DFS switch and fuse element, rear view.

Type DFS Metal-Enclosed Switchgear—*drawout fused switch*—provides compact, low-cost power switching for high voltage circuits in commercial buildings, institutions, and small industrial plants. DFS Switchgear meets a wide range of applications—with fault interrupting ability up to 250 mva at 4160 volts and 500 mva at 13,800 volts . . . load break rating 600 or 1200 amperes . . . full fault closing ability of 60,000 amperes for 5 kv and 40,000 amperes for 15 kv.

DFS Switchgear provides these major advantages:

Drawout design assures completely safe switch inspection and fuse replacement.

Component design versatility meets a broad range of applications, including automatic transfer and remote control.

Simplified metal-enclosed construction presents compact, modern appearance.

Maximum service reliability assured by extensive High Power Laboratory design-proving tests.

For full information call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa., for Descriptive Bulletin 32-750. *You can be sure . . . if it's Westinghouse.*

J-61011-R1

Westinghouse

Circle 587 on postcard, page 33

WHEN THE PROBLEM CALLS FOR PAINT THE BEST ANSWER

IS INVARIABLY **Barreled Sunlight** Paints — ENGINEERED

Safety coding, through the proper marking of plant hazards and protective equipment, plays an important role in industrial accident prevention programs. You have it, or *should* have it, in your plant!

To help you make sure you *are* making the most of paint to safeguard the lives of your plant personnel, why not call in your Barreled Sunlight representative for free "Color Survey" Service. This personal, in-plant survey by a trained color expert includes formal recommendations for a complete, practical painting plan tailored to your exact plant requirements.

Take this first step toward the economy and effectiveness of a planned painting program now. Your inquiry does not obligate you in any way . . . it is your indication of further interest.

BARRELED SUNLIGHT PAINT COMPANY
125-F Georgia Avenue, Providence 5, Rhode Island

I want to learn more about your Free "Color Survey" Service.

☐ Please have your representative call to arrange an appointment at my convenience.

☐ Also, please send me your "Quick Reference Guide" to Barreled Sunlight Paints, plus your booklet, "How To Reduce Painting Costs".

Name.....

Title.....

Company.....

City.....*Zone*.....*State*.....

Circle 588 on postcard, page 33

NEW! *Another Clayton Mark Exclusive!*

HIGH PRESSURE–POSITIVE SEAL

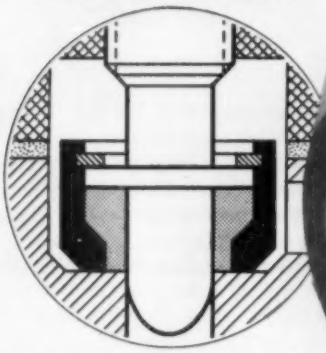
PETRO® SHUT-OFF VALVE

With these Superior Features...

- Corrosion-resistant 18-8 stainless steel body
- Leakproof Teflon seal and seat
- Positive high pressure sealing at 10,000 PSI
- Opens and closes easily under maximum pressure
- Stem packing replaceable under pressure
- Monel stem eliminates galling of threads under load
- Sizes available ¼" through ¾"

New Clayton Mark PETRO SHUT-OFF VALVE, with its many features, is suitable in chemical, hydraulic, refining, fuel and steam applications as well as for use in air (gas) and vacuum systems. See your distributor for demonstration or write Clayton Mark for literature.

POSITIVE SEALING



Swivel cage attached to free turning Monel stem acts as forming die when valve stem is screwed down. During closing operation, the stem forces the Teflon from cage to form a bubble-tight, Teflon-to-metal seal.

CLAYTON MARK
& COMPANY

1900 DEMPSTER STREET · EVANSTON, ILLINOIS · U.S.A.

PUMPS · WATER WELL SUPPLIES · CONDUIT · UNIONS · TUBING

1600

Circle 589 on postcard, page 33

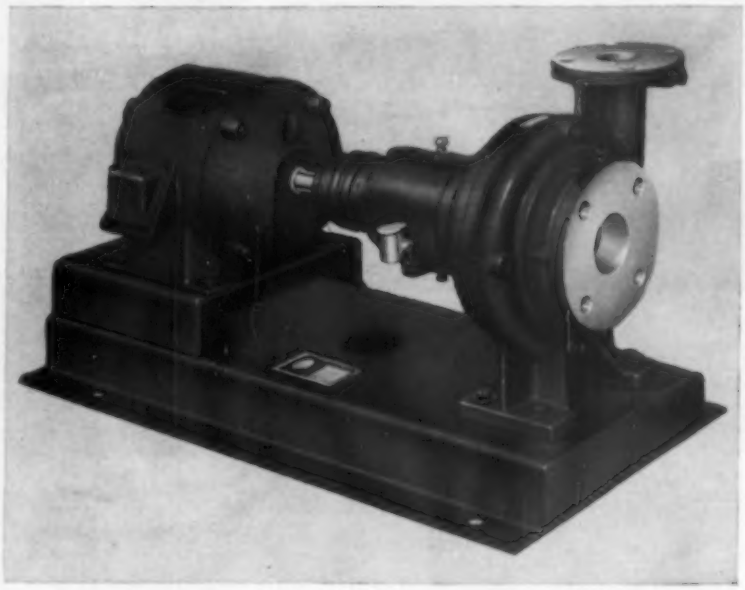
prove it to yourself!

...THAT THE SERIES 1510-B CENTRIFUGAL PUMP OFFERS MORE

1510-B FEATURES

- Vertical split case design—solid-type volute can be left in pipe line when servicing pump.
- Removable bearing frame assembly—can be lifted out without disturbing piping or motor leads.
- Interchangeable bearing frame assembly—one unit fits a wide range of pump sizes.
- Positive oil lubrication with visual check.
- Anti-friction *roller bearings.*
- Mechanically balanced impeller. Balancing chamber and pressure relief holes in impeller reduce thrust to a minimum—lengthen pump life.
- Leak-proof "Remite" seal. Carbon seal ring faces on harder-than-glass Remite floating seat. Assures long, trouble-free life.
- Special alloy steel shafts, superfinished, oversized.
- Performance guaranteed—100% pre-tested at the factory for conditions of head and capacity specified.
- Choice of all-iron, bronze-fitted, or all bronze.
- Capacities to 2000 GPM, heads to 420 ft.

Why not get your full dollar's worth of pump value...send today for selection data on the B&G 1510-B Centrifugal Pumps.



Check any centrifugal pump of comparable capacities against B&G 1510-B Pump features!

B&G Series 1510-B Centrifugal Pumps are distinguished by all the features listed at left. To compare any other pump with the 1510-B, place check marks in the red boxes beside the features also offered by the competitive pump.

We'll wager you'll wind up with quite a number of unchecked boxes!

The balanced design of this *vertical split case* pump is definite assurance of smoother, more efficient performance and longer life. Its design enables the bearings to withstand loads far in excess of those produced by any pump and motor combination in the 1510-B series ...an added feature of dependability.

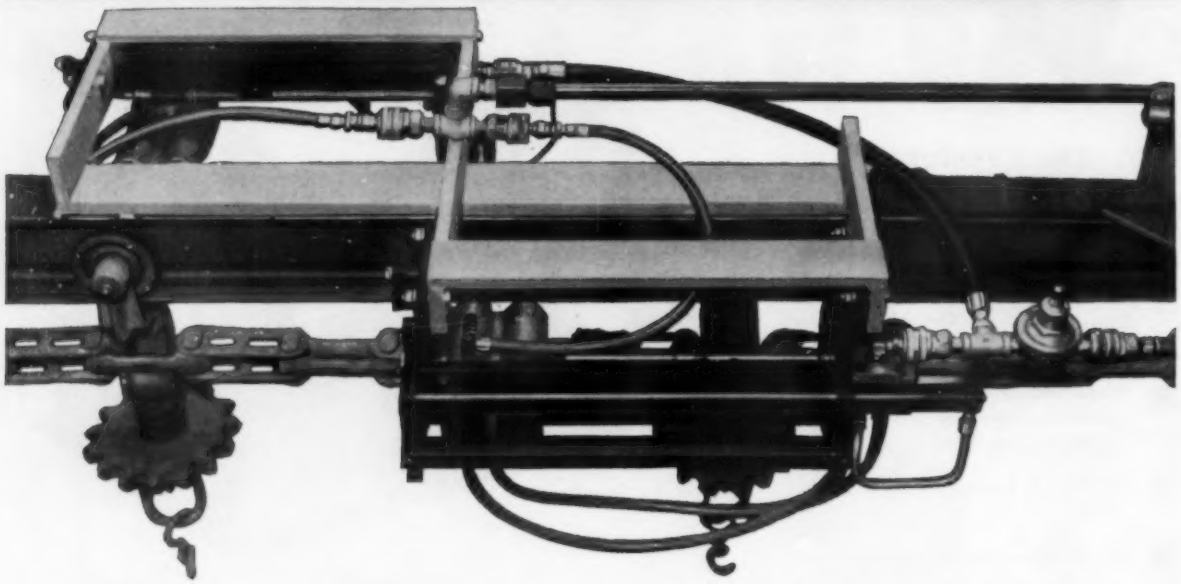
NOW AVAILABLE IN "C" SIZE UNITS UP TO 75 H.P.
2000 GPM, 170 feet, 1750 RPM,
3"—4"—6"—8" discharge connections

BELL & GOSSETT COMPANY
Dept. GR-53, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

Circle 590 on postcard, page 33

NEW ARO PORTABLE TROLLEY CONVEYOR LUBRICATOR



Easily Moved From One Conveyor to Another - *Weighs only 26 lbs.*

- One man can install while conveyor is running
- Automatic—lubricates while conveyor is in motion
- Fold-A-Way mechanism prevents damage to lubricator or conveyor in case of bent wheels
- Dependable—never misses a fitting
- Lubricates from 100 ft. to 100 miles of conveyor on one filling of lube
- Pays for itself in labor and maintenance saved

Correct lubrication of trolley conveyors saves you lots of headaches. You avoid costly shutdowns and delays. You slash repair and maintenance costs. And you add extra years to conveyor life.

The new Aro Portable Trolley Conveyor Lubricator *assures* correct lubrication automatically . . . even when standard conveyor wheels are intermixed. There's no dripping to cause slipping and injuries either, because this unit will not discharge grease unless coupler is properly connected to fitting. Air powered for dependability, with floor-level control to save labor.

ASK YOUR ARO DISTRIBUTOR TO ARRANGE FOR A DEMONSTRATION. OR, WRITE ARO TODAY.

The ARO EQUIPMENT CORPORATION

Industrial Division, Bryan, Ohio • Aro Equipment of California, 3141 S. Grand Ave., Los Angeles 7. Aro of Canada, Ltd., Rexdale (Toronto), Ontario. Offices in all Principal Cities.

ARO®

TROLLEY CONVEYOR LUBRICATORS

ARO-PAK AIR-CHARGED LUBRICATORS

AIR TOOLS AUTOMATION TOOLS AIR HOISTS

Circle 591 on postcard, page 33

The Temperature Control Powered by the

IRREPRESSIBLE FORCE OF MERCURY—

for Accuracy with Rugged Dependability

All Partlow temperature controls are directly and positively actuated by mercury, the metal in liquid form whose reaction to changes in temperature is as predictable as it is powerful.

Unlike delicate electronic controllers, the mercury-actuated Partlow requires no outside power source. No amplifiers. No finicky levers. And no "babying"! With a Partlow you can be sure of getting accurate, dependable control even under extreme conditions of shock and vibration.

Mercury-actuation makes possible maximum design efficiency and simplicity too. The Partlow has fewer parts to go wrong. And fewer service problems (with less "down" time) should trouble occur. You can replace the thermal element of any Partlow control instantly, right at the job site, without recalibrating, fitting or factory adjustment.

Whatever the process or application, you'll find a Partlow temperature control to fit it dependably, economically, *precisely*. Mail coupon today for full details.

PARTLOW

TEMPERATURE CONTROLS

World Export:
Ad. Auriema, Inc., 85 Broad Street, New York 4, N. Y.

THE PARTLOW CORP., Dept. PE-661
NEW HARTFORD, N. Y.

Please send condensed Catalog of Partlow temperature controls and allied equipment for industrial heating and refrigeration.

Name and Title .....

Company .....

Address .....

City and State .....

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Circle 592 on postcard, page 33

Steam trap dependability is a matter of what the manufacturer puts into the trap

ARMSTRONG TRAPS ARE DESIGNED AND MADE TO GIVE YOU DEPENDABILITY

1. Efficient, proved operating principle

Armstrong Traps provide the most advanced development of the time-proven inverted bucket principle. Simple, but effective, there isn't much that can go wrong.

2. Good design

Armstrong Trap design gives big capacity in a small package. The mechanism is virtually fool-proof. All body styles are easy to inspect and maintain without removal from the line.

3. Highest quality materials of construction

Only the best goes into Armstrong Traps. Bodies are close grained 30,000 tensile iron castings or high quality forgings. Working parts are all tough, corrosion resistant stainless steel.

4. Good workmanship

Armstrong Traps are made by craftsmen who take pride in their work. Careful inspection and frequent checking insure the quality of the trap.

5. Application know-how

Your problem has probably been solved already in the extensive experience of the Armstrong engineering and sales organization. You can be sure of sound, dependable recommendations.

Your local Armstrong Representative can show you what Armstrong dependability can do for you. Call him today or write direct.

860 Series for low pressure heating service.

800 Series, side inlet, side outlet.

No. 801, side inlet, bottom outlet.

880 Series, integral strainer.

200 Series, bottom inlet, top outlet.

Forged Steel Series for high pressures, high temperatures.

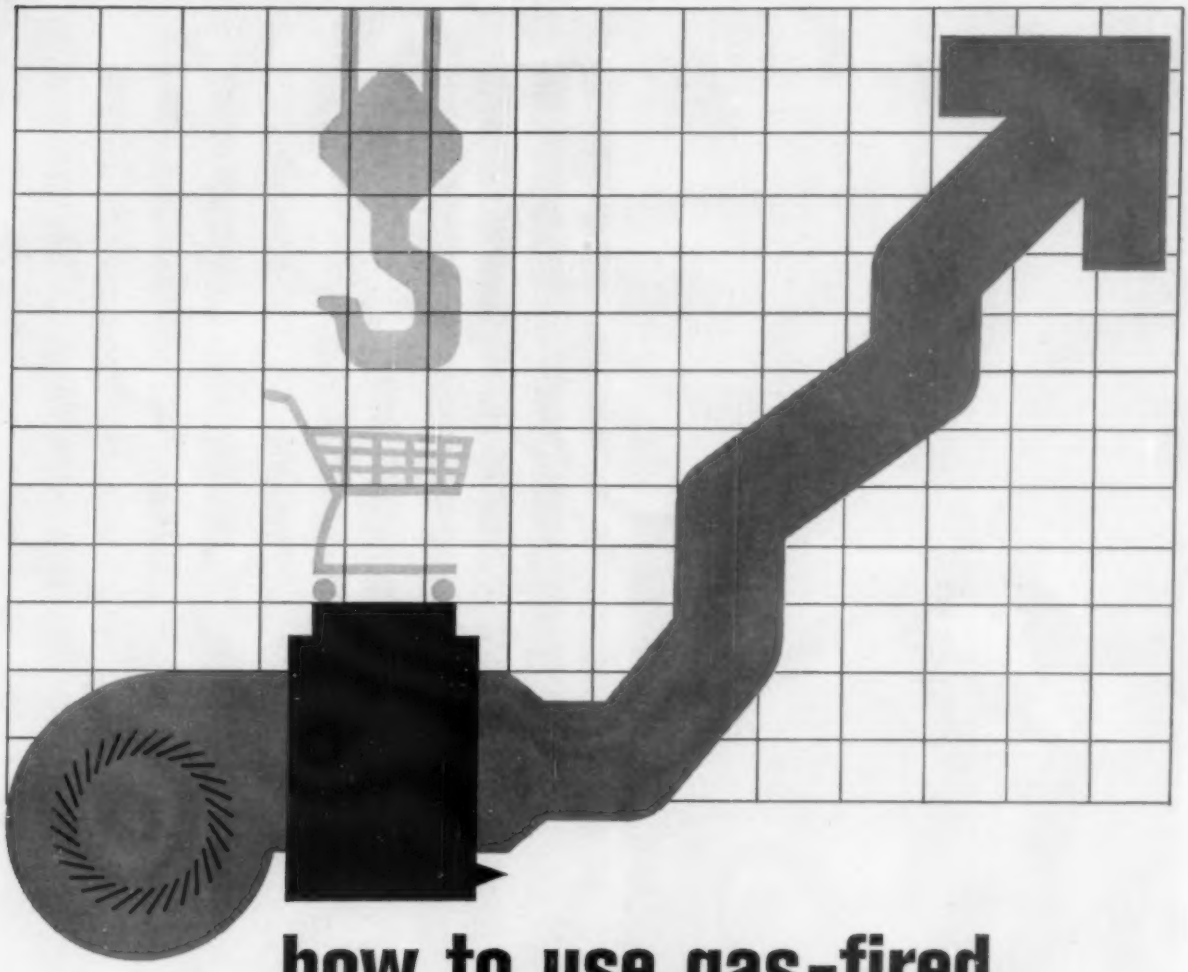
The 48 page Armstrong Steam Trap Book tells how to correctly size, install and maintain steam traps for any pressure, any temperature, any load plus full catalog data on Armstrong Steam Traps. Ask for Catalog K.

ARMSTRONG MACHINE WORKS

9124 Maple Street Three Rivers, Michigan

See Our Catalog in Sweet's Plant Engineering File

Circle 593 on postcard, page 33



how to use gas-fired duct furnaces most profitably

Free from Reznor: the third in a series of new Reznor Heating Handbooks, "Commercial and Industrial Applications of Duct Furnaces." Duct furnaces offer a relatively new way of heating through air distributing systems. They provide all the economies of direct fired heaters, yet may be located at a distance from the space to be heated. Installation is easy — just connect gas pipe, power, and a vent.

To use duct furnaces most advantageously requires some knowledge of special considerations involved in specific commercial and industrial applications.

That's the purpose of this new handbook, published by Reznor, the world's largest manufacturer of gas unit heaters. It tells about the various ways Reznor duct furnaces can be used for heating or in combination with cooling systems. Also included are illustrations, load calculating data, and practical suggestions to help you get better heating at lower cost.

For your copy, mail the coupon to Reznor. And for more information on Reznor heaters, call your distributor or nearby district office listed in the Yellow Pages under "Heaters-Unit".

REZNOR HEATERS

REZNOR MANUFACTURING COMPANY
Dept. PE-6, Mercer, Pa.
Send me a copy of "Commercial and Industrial Applications of Duct Furnaces".

name _____ title _____

company _____

address _____

city _____ state _____

Circle 594 on postcard, page 33

This smart-looking, modern reception room and office has a distinctive rose-colored China Blend "K&M" Corrugated Asbestos-Cement Panel, with partitions in bright yellow and bone white "K&M" Flat Sheets.

"K&M"® COLORED STRUCTURAL SHEETS

The eye-appeal of color... the durability of asbestos-cement

Now, you can combine utility with decorative appeal by the use of "K&M" Asbestos-Cement Structural Sheets with the new "KolorMate" Finish.

These hardy, fireproof sheets retain all the ruggedness and durability of plain asbestos-cement sheets. However, 15 striking colors make them as good-looking as they are tough. They open up for you an unlimited range of decorative possibilities as siding, soffits, facades, marquees, office and shop partitions, and wall trim, to name but a few applications.

Under rigorous testing in K&M's research and development laboratories, these colors did not blister, peel, yellow or fade. Their "KolorMate" baked-on acrylic finish, developed exclusively for "K&M", bonds securely to the surface. This smooth, semi-gloss finish won't crack or chip during installation . . . can be scrubbed repeatedly without damage.

Write today for more information on "K&M" Asbestos-Cement Sheets with "KolorMate" Finish to: Keasbey & Mattison Company, Ambler, Pa. Dept. B-4661.

K·M BEST IN ASBESTOS

Keasbey & Mattison at Ambler

Circle 595 on postcard, page 33

Planned lighting *can* improve output. Consult with your Graybar man: he is well versed in the best and latest in lighting for better production, in plant or office.

Moreover, Graybar offers the widest selection of lighting equipment* available from *any single source!* For lighting . . . or ventilation, motors, controls, power distribution equipment . . . call Graybar. We'll work with you or your electrical contractor. 96

*and G-E lamps, too

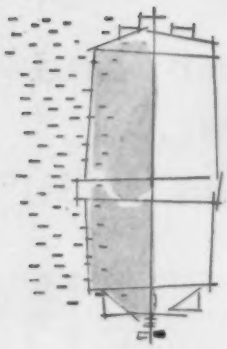
GraybaR

ELECTRIC COMPANY, INC.

Everything Electrical GraybaR ELECTRIC COMPANY

420 LEXINGTON AVENUE, NEW YORK 17, N. Y. • OFFICES IN OVER 130 PRINCIPAL CITIES

Circle 596 on postcard, page 33



DOLLINGER
DRY FILTER
SPECIALISTS
FOR
40 YEARS

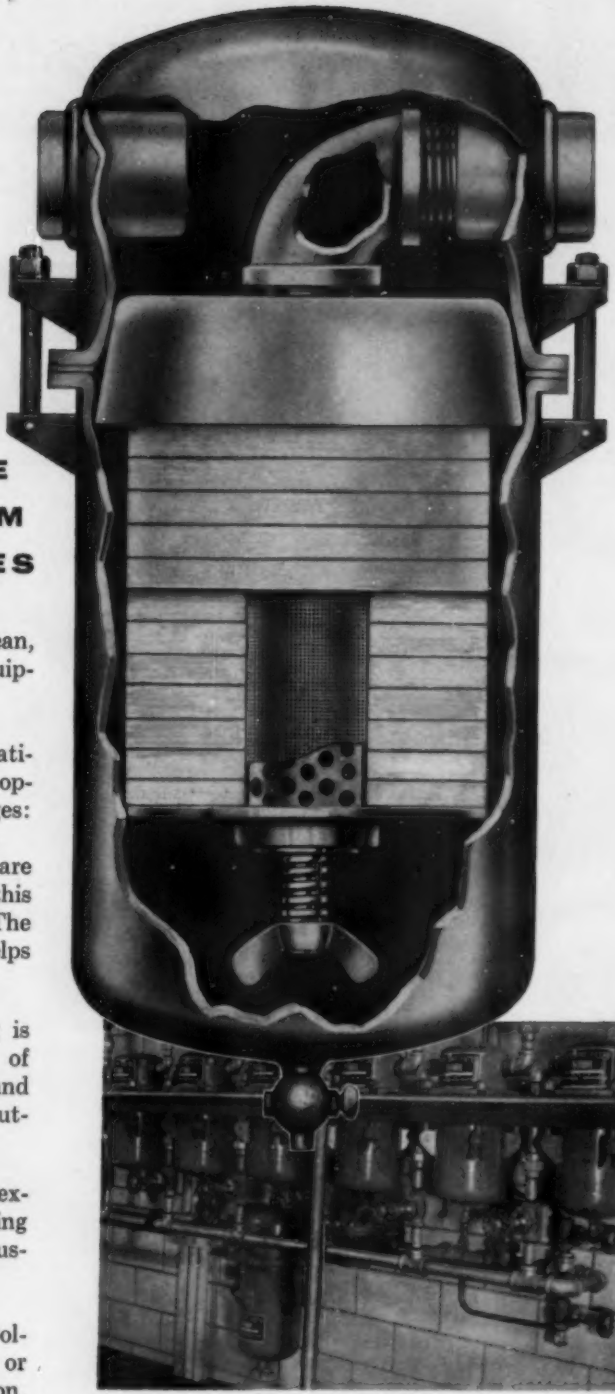
REMOVE MOISTURE AND DIRT FROM COMPRESSED AIR LINES

Dollinger Staynew Filters keep air dry and clean, assure smooth operation of mechanical equipment despite constant change in humidity.

Model AAPHS Staynew Filters protect pneumatically-operated controls, instruments and air-operated tools. They offer a variety of advantages:

- Low resistance—heavier dirt particles are eliminated before the air itself is filtered; this prevents clogging of the filtering element. The result is low resistance to flow; this helps maintain line pressures, saves horsepower.
- Continuous operation—frequent cleaning is eliminated because of a liberal amount of space in the housing for accumulated dirt and condensate; this can be drained without shutting down the line.
- Accessibility—interior parts are easily exposed for inspection and cleaning. Loosening of swing bolts permits removal of lower housing without breaking pipe connection.

For positive, trouble-free filtration, specify Dollinger. Call our representative nearest you, or write for Bulletin 200. Dollinger Corporation, Industrial Products Division, **55** Centre Park, Rochester 3, New York.



Part of an installation of 18 Staynew Filters protecting air-operated instruments in a power plant. Model AAPHS Filters operate effectively at pressures as high as 125 lbs. gauge.

PROTECTOMOTOR

STAYNEW FILTERS

DOLLINGER

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS • HIGH PRESSURE FILTERS AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

Circle 597 on postcard, page 33

Circle 598 on postcard, page 33 ➔

Quality... the best economy of all

Another product of Sunoco research . . . a fire-resistant hydraulic fluid

The flame test, above, dramatizes the effectiveness of Sun's new fire-resistant hydraulic fluid. The wick in the conventional fluid burns readily; the wick in Sun's new fluid just can't be lighted.

SUNSAFE, a water-in-oil emulsion, eliminates fire hazards . . . provides increased safety to personnel and equipment. At the same time, operators get the essential performance characteristics of a top-grade hydraulic oil—low rates of wear, long service life, and protection against rust and corrosion.

This combination of *quality* in engineering know-how, and *quality* in product, proves once again that *quality* in any sense is the best economy of all.

For 73 years Sunoco has meant quality right down the line. Today, this quality is found in more than 400 Sunoco industrial products. SUN OIL COMPANY, Phila. 3, Pa., Dept. I-14.

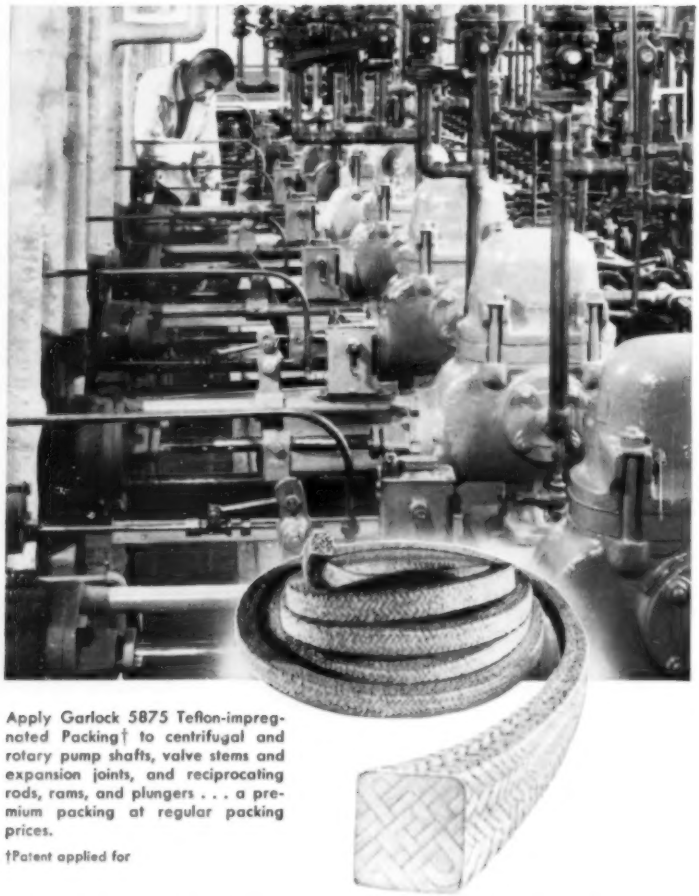
In Canada: Sun Oil Company Limited, Toronto and Montreal.

MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

SUNOCO®

PRINTED IN U.S.A.

ENGINEERED TEFLON PRODUCTS



Apply Garlock 5875 Teflon-impregnated Packing† to centrifugal and rotary pump shafts, valve stems and expansion joints, and reciprocating rods, rams, and plungers . . . a premium packing at regular packing prices.

†Patent applied for

NEW GARLOCK TEFLON* PUMP PACKING COSTS 40% LESS!

Through an improved manufacturing technique, Garlock offers a Teflon-impregnated LATTICE BRAID† Packing at a reduction of approximately 40% over the price of similar competitive packing. Designated Garlock 5875, this packing can be purchased at prices comparable to regular packing.

Enjoy premium benefits without a premium price. Garlock 5875 offers a high Teflon content—more than 30% by actual weight—for greater protection, reduced wear. In temperatures from −90° F to +500° F, Teflon-impregnated LATTICE BRAID Packing is recommended for use against moderately destructive and corrosive mineral acids and caustics. For more destructive and corrosive applications Garlock 5888 Teflon-treated fiber packing is recommended. Teflon, too, is as "frictionless" a material as you will find; this greatly reduces wear to the packing itself, and to any moving parts that it contacts during normal operation.

Specialized construction provides longer life, less maintenance. Garlock 5875 Packing is made from Teflon-impregnated white asbestos yarn, woven in the superior LATTICE BRAID construction. Here, each strand of treated yarn is intertwined at a 45° angle through the packing body. This completely integrates the structure for greater strength and, unlike ordinary square or round braid, eliminates individual *layers* of yarn—layers that, once worn through, destroy the usefulness of the packing. Without a layer or single outer braid to wear through, LATTICE BRAID remains unified without disintegrating far beyond the limits of other packings.

Enjoy fast delivery from warehouse stock. Garlock 5875 Packing is immediately available in sizes from ¼" through ⅝" in either spool or reel form to meet your specific needs; also available on order in ring form in these sizes. Specify now from your local Garlock representative at the nearest of the 26

GARLOCK

Garlock sales offices and warehouses throughout the U.S. and Canada. Or, for more information, write for Catalog AD-185, Garlock Inc., Palmyra, New York.

Canadian Div.: Garlock of Canada Ltd.
Plastics Div.: United States Gasket Company

Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

*DuPont Trademark for TFE Fluorocarbon Resin
†Registered Trademark

Circle 599 on postcard, page 33

Nalco Treatment Technique Protects Non-Wetted Cooling Tower Sections from Microbiological Attack

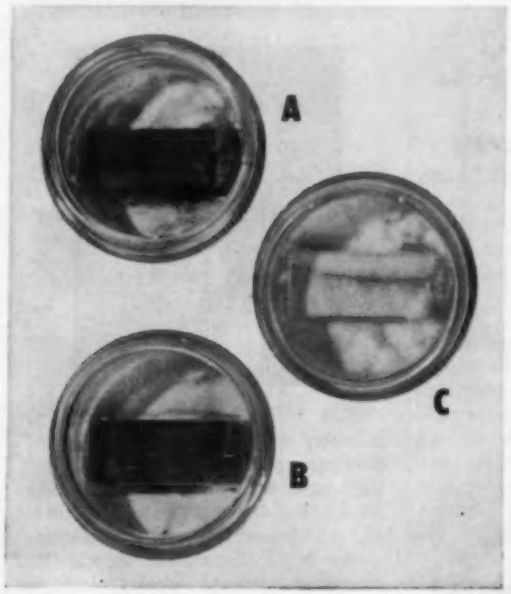
Simple, Low-Cost Method Delivers Effective Chemical to Non-Wetted Tower Areas

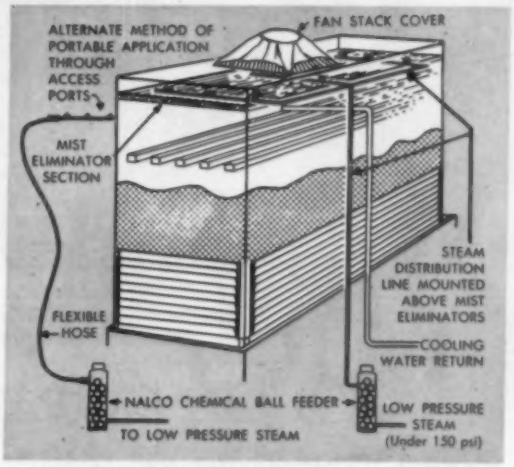
Tower sections above the water distribution level have presented a tough protection problem. Chemicals in the water rarely reach fan stacks, top decks, plenum chambers and mist eliminators in sufficient concentration to be completely effective. All of these areas are subject to damaging wood rot caused by microbiological attack. Consequently, a difficult manual spray method has been used to combat this problem. Nalco now recommends using a steam application method to carry powerful microbiocides into the non-wetted areas as a positive method of reaching *all* non-wetted surfaces. The technique is simple, low-cost, and has proved very effective in keeping non-wetted lumber rot-free.

How Steam Treatment Works

Fans are shut down, and fan stacks covered. It is possible to circulate water in the tower during steam treatment, but faster results can be had if circulation is also stopped. Low pressure steam is directed through a container of *Nalco* ball briquette microbiocide chemicals, which are carried with the steam. Perforated steam pipes, inserted into the plenum chamber, carry the steam chemicals into all spaces above the water distribution lines, permitting the chemicals to penetrate wood surfaces and providing protection against wood rot.

These test blocks were placed on a nutrient agar inoculated with a known wood rot organism. Test blocks A and B had been removed from a tower treated with Nalco steam spray. Test block C had not been treated. Notice extreme accumulation of fungal organisms on untreated block C.




ALTERNATE METHOD OF PORTABLE APPLICATION THROUGH ACCESS PORTS
FAN STACK COVER
MIST ELIMINATOR SECTION
STEAM DISTRIBUTION LINE MOUNTED ABOVE MIST ELIMINATORS
FLEXIBLE HOSE
COOLING WATER RETURN
NALCO CHEMICAL BALL FEEDER
LOW PRESSURE STEAM (Under 150 psi)
TO LOW PRESSURE STEAM

Typical installation of the Nalco steam spray system.

Portable or Permanent?

A number of Nalco-treated cooling towers have been equipped with permanently-installed steam pipes for microbiological control. Others are treated with steam lines and feeding equipment which is put in place for treatment, but moved from tower to tower as needed. Either way, this Nalco technique is providing a degree of economical protection that controls the wood rot hazard, removing it from the list of operators' problems.

Follow-Through Assistance

Your Nalco Representative will be glad to give you details on how your cooling tower non-wetted sections can be protected effectively; and tell you whether your towers need this treatment now. If steam treatment is indicated, he will help set up the necessary equipment, supervise application to assure results, and make periodic checks on the continuing effectiveness of the treatment.

Chemical microbiocides used for steaming are compatible with other *Nalco* chemicals used in cooling towers for stabilization, water-borne microbiological control, and scale and corrosion control. Your Nalco Representative is an expert in this area, too . . . Use his knowledge and experience—backed by the world's largest water treatment service organization—to solve *all* your cooling water treatment problems. Call him today, or write direct, for Prints 264, 265 and 266 which define steam spray application.

NALCO CHEMICAL COMPANY

6222 West 66th Place • **Chicago 38, Illinois**

Subsidiaries in England, Italy, Mexico, Spain, Venezuela and West Germany
In Canada: Alchem Limited, Burlington, Ontario

Nalco. . . . **Serving Industry through Practical Applied Science**

Circle 600 on postcard, page 33

Nalco CHEMICALS
Nalco SERVICES

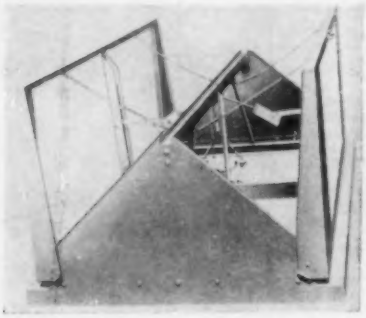
PLANT ENGINEERING EQUIPMENT

Edited by M. E. Heniken

More information on any of this equipment can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 33-34.

SKYLIGHT UNIT provides heat, smoke, explosion relief

The Sky-Lite Pyrojector offers all advantages of a regular skylight plus those of company's Pyrojector. The latter is designed for venting heat, smoke or shock waves upward through the roof, and to this basic unit manufacturer has added large fiber glass windows in the original doors. The complete unit is installed entirely on the roof. It has a quick release chain for manual operation, also handles which permit opening from the roof without disturbing the release mechanism. When dampers open, snubber chains and springs hold them vertical to permit maximum draft. Swartwout Fabricators, Inc.



For details, circle 1 on Post Card

IMPACT DOOR is covered all over with rubber

The Durador absorbs—rather than resists—impact by fork trucks. Its warp-resistant, ⅜-in. plywood core is covered by a permanently bonded ¼-in. live-rubber coating at the bottom half for extra protection against gouging by trucks, and by a ⅛-in. coating at the top half. Lead edge protection is provided by a ⅜-in. coating. And full-length flexible rubber hinge assures return to normal closure after opening. The door functions silently, offering no injury hazards due to sharp edges or splintering.

Ease of installation is a feature—you don't have to provide special jambs or recess any equipment in floor or lintel. The rubber covered door panels are supplied separate from the pre-drilled hinge unit. Hinges are erected first, then panel placed in the rubber-covered door clamp of the hinge. This is said to permit accurate fitting at the doorway, even at slightly oversize openings. Duradors come in

stock and intermediate industrial doorway sizes. Clark Door Co., Inc.

For details, circle 2 on Post Card

PHOTOELECTRIC UNITS increase machine operator safety

Modulite Systems use a modulated (pulsating) light beam to detect the presence of a machine operator's hand or arm in a high-danger area. Chief benefit of modulated light equipment is that its receiving element is not influenced by ambient light in the operating area. A rotating disc modulates the light. The receiver is "tuned" to the modulated-light frequency. In use, interruption of the beam causes a signal (produced by a projector, shown at left in photograph, receiver, right, and control relay setup) that will stop a machine.

A choice of projectors is offered with 1- or 2-in. light beams having ranges up to 20 and 80 ft. Modulite Systems are for use where only limited access to danger area is possible and entry can be made only through the light beam, which must be completely blocked for relay operation. Applications include presses, brakes, shears and roll-forming machines. The Clark Controller Co.

For details, circle 3 on Post Card

LIQUID LEVEL SWITCH can't be "fooled" into actuation

This ultrasonic liquid level switch is described as a small, rugged unit with low power requirements and accuracy within ±1/64 in. Because of dual crystal design, only a complete liquid path between sensing elements causes it to respond—a drop of liquid clinging to its sensor won't influence it. Unit may be used on tanks containing any type of liquid, for high or low level warning and control, flow monitoring, mixing control, leak detection, and tanking and voiding operations. It comes with separate probe and control unit, or with the two combined. Probe temperature range is —195 to 250 C, and control unit has a range of —65 to 100 C. The Liquidometer Corp.

For details, circle 4 on Post Card

PROTECTION PACKAGE—breaker in its own enclosure

The K-Don line of circuit breakers—low voltage current-limiting units affording fault protection against currents up to 200,000 amp is now available in individual enclosures for application where single, wall-mounted breakers are used. Enclosures afford large and accessible cable make-up area; ease of trip unit adjustment and maintenance; drawout operation; visible break disconnect contacts. Individually enclosed breakers can be

had for electrical or manual stored-energy operation in 600- and 1600-amp ratings, up to 600 v a-c or 250 v d-c. Bulletin 4300-1A gives data. I-T-E Circuit Breaker Co.

For details, circle 5 on Post Card

CONTROL STATION selects manual, automatic function

Unusually small in size, Type AMA Control Station is an electronic manual-automatic unit requiring less than 17 sq. in. of panel space and weighing 34 oz. Units are designed to be installed side by side with 1-in. vertical clearance. Designed for use in electronic systems to provide visual indication of system response, control station also selects either manual or automatic control functions. When system is operating manually, control station pushbuttons can control process. Republic Flow Meters Co.

For details, circle 6 on Post Card

SAFETY STEP LIGHTS install on existing stair risers

Only ½ in. thick, these Rayescent lights mount on existing steps, aisles and walks, with little or no carpentry or alterations. The 4-by-8 in. unit consists of a flat lamp, metal frame and two concealed wires. Maintenance is

simplified, since the light has a rated life of 10,000 hr. Rayescent lamps are rated 1 w at 120 v a-c, and because of their negligible power consumption, may be operated continuously. They produce light by electroluminescence. The glass panels have a phosphorous-coated electrical conductive film. When voltage is applied, the panel glows, producing green or yellow light, depending on phosphor used. Westinghouse Electric Corp.

For details, circle 7 on Post Card

LIQUID HERBICIDE solves weed control problems

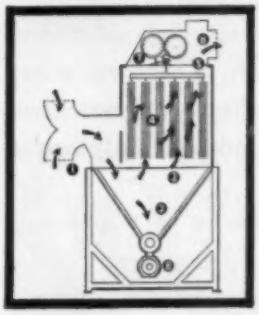
Veg-Out is described as a non-toxic, non-selective, non-flammable and free-flowing liquid. When sprayed on the earth's surface it is carried into the soil by rain and absorbed by the roots of all kinds of vegetation. After the

NEW TORIT DUST COLLECTOR IS AUTOMATIC!

Save real dollars with the benefits from this *automatic* dust collector. No more interruptions on production lines! Maintenance problems are practically eliminated. This all new continuously cycling TORIT dust collector *automatically* cleans your air and *automatically* shakes its own filters and blows them clean with reverse air flow. Collected material is emptied *automatically*.

OTHER EXCLUSIVE TORIT BENEFITS

- automatic filter-shaker mechanism is simple, maintenance-free
- different dusts may be collected separately
- highest air-to-cloth ratios (from 5 to 25:1) and longer filter life
- only ¾ H.P. required for fully automatic operation
- polished ⅛" aluminum construction for minimum floor loading
- modular design—5′ wide x 4′-8″ long (for two sections) x 15′-6″ high—saves space, lends ease and versatility to installation. Use up to 12 modular sections for each application! No limit to CFM capacity!



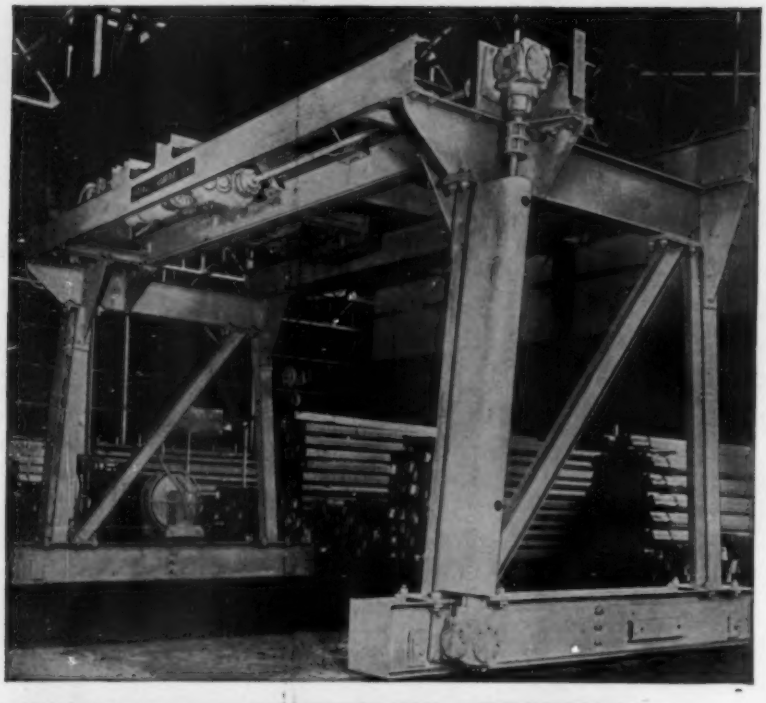
AUTOMATIC AND EFFICIENT, the filtering cycle of each TORIT section is self-timing. A separate blower on the clean air side keeps collector under suction. Then, (1) dust-laden air is taken into manifold; (2) coarse dust drops out; (3) fine dust is carried to filtering sections; (4) filter tubes catch dust on inside surfaces; (5) clean air emerges from filters; (6) to suction fan and clean air discharge outlet. (7) *Automatic* shaking and reverse air filter cleaning mechanism. (8) Conveyor *automatically* removes and discharges accumulated dust.

Have a cleaner plant, better morale and high productivity with lowest maintenance costs. Special design services are available based on your individual requirements. Write today for literature.

TORIT MANUFACTURING COMPANY

Automatic Collector Division 1133 Rankin St., St. Paul 16, Minn., Dept. 1834

Circle 601 on postcard, page 33



CHICAGO TRAMRAIL

GANTRY CRANES

At the modern plant of one of the country's largest aluminum companies, Chicago Tramrail Gantry Cranes handle long extruded pieces from a 14,000-ton extrusion press . . . transfer these pieces to other operations throughout the mill.

Fourteen Chicago Tramrail Full Gantry Cranes provide individual handling equipment for individual operations to eliminate waste time waiting for busy overhead cranes. Designed for heavy-duty, continuous service, these Gantries are built with maximum headroom and maximum clearance between legs to operate independently under the large overhead cranes.

For a practical, economical solution to your materials handling problems, see our experienced engineers. Special designs, sound engineering and broad application knowledge qualify us for helpful service.

CHICAGO TRAMRAIL DIVISION
CONCO ENGINEERING WORKS, INC.

1324 S. KOSTNER AVENUE • CHICAGO 23, ILLINOIS

OVERHEAD CRANES • JIB CRANES • STACKER CRANES • MONORAIL SYSTEMS

Circle 602 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

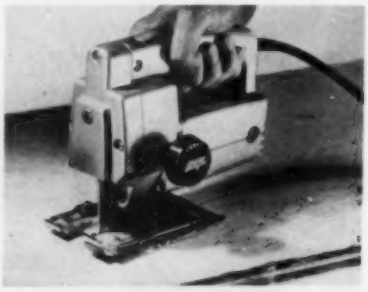
(Begins on page 180)

roots die and the entire plant is destroyed, the weed killer leaves a long-lasting, residual effect which discourages new growth. It is claimed to kill brush, trees, Canada thistle, poison ivy, quack grass and other undesirable vegetation. A gallon of Veg-Out diluted with 9 gal of water treats 150 to 200 sq ft during any season of the year, provided application is followed by a few inches of rainfall. Vegetation over 6 in. high should be cut and removed before treatment. National Chemsearch Corp.

For details, circle 8 on Post Card

JIG SAW, heavy-duty, has two working speeds

Model 160 Jig Saw has a high cutting speed of 3200 strokes per minute for wood, plastic and compositions; and a low speed of 2600 for metal. A thumb-tip control switch enables selection of speed or "off" position. For heavy industrial use, this saw can cut 2½ in.

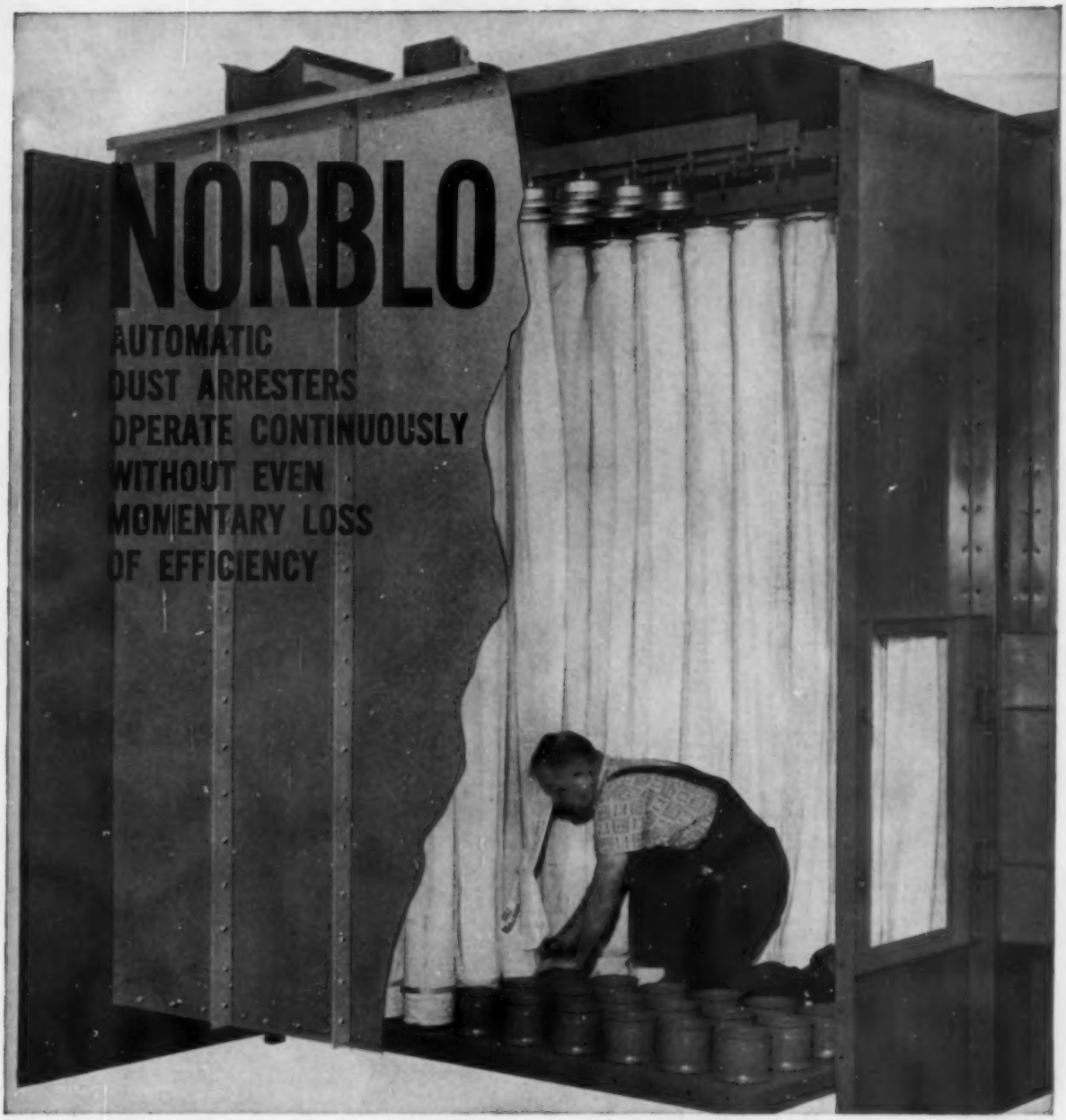


in wood, ¾ in. aluminum and ¼ in. in steel. A feature is an adjustable, three-position horizontal foot. With this foot in first position, smooth cuts in plywood, compositions or laminates are made using a hollow ground blade. For general purpose cutting, set tooth blades are used with the foot in its second position. The third position allows bevel cuts up to 45 deg right or left, 2 in. deep. Model 160 costs around $100, including four blades and rip fence. Skil Corp.

For details, circle 9 on Post Card

LIQUID DETERGENT cleans practically all surfaces

CalClean is a heavy-duty detergent for cleaning evaporator coils, metal air filters, fans and other surfaces coated with grease and dirt. It can be used on almost any metal, wood, cement, glass, tile, linoleum or painted

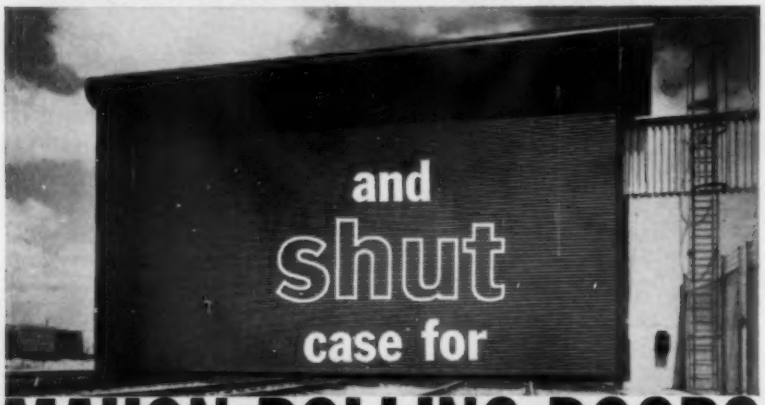


Periodic cleaning, repair or replacement of bags, and minor maintenance can be accomplished while the collector remains in operation. One compartment, as shown above, can be isolated in the Norblo design, with all mechanical parts outside the gas stream. Continuous cyclic shaking, by compartment, allows operation without interruption. ■ This is why in modern plant operations you'll find an increasing preference for Norblo Automatic Bag Arresters. Where efficient production requires continuous operation more and more industries specify Norblo Dust Arresters. Over 80% of the cement industry relies on Norblo equipment for drying, grinding and finishing operations. ■ Buell-Norblo equipment can play an essential part in your process. Write for complete information on any type of dust collection problem. Buell Engineering Company, Inc., Dept. 14F, 123 William Street, New York 38, New York. Northern Blower Division, 6423 Barberton Avenue, Cleveland, Ohio. Electric Precipitators · Cyclones · Bag Collectors · Combination Systems · Fans · Classifiers.

buell
Norblo®

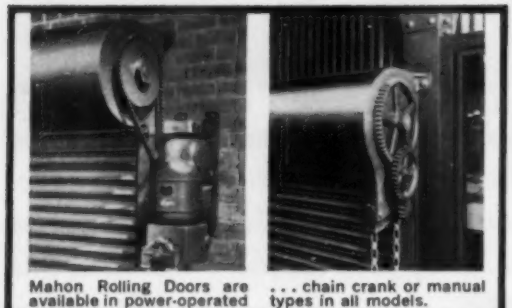
Circle 603 on postcard, page 33

King-size (43-ft. wide, 22-ft., 7-in. high) Mahon Rolling Steel for a Detroit warehouse of Grand Trunk & Western Railroad. Contractor: F. H. Martin Construction Company.



MAHON ROLLING DOORS

Open: Mahon Rolling Doors are versatile space savers. **Shut:** they are sturdy protection. In between both stages, they are convenient, quick-acting, work and time savers. Mahon supplies Rolling Doors in standard or Underwriters' Labeled Types to suit your specific needs for new or old openings. All-metal construction with Bonderized slats insure long life, minimum maintenance. Whether you're building, modifying or replacing—investigate the multiple-benefit 'case' for Mahon Rolling Doors.



Mahon Rolling Doors are available in power-operated . . . chain crank or manual types in all models.

MAHON COMPANY BUILDING PRODUCTS

- Aluminum or Steel Curtain Wall
- Rolling Steel Doors (Standard or Underwriters' labeled)
- Fire Walls (Underwriters' rated)
- M-Floors (Steel Cellular Sub-Floors)
- Long Span M-Deck (Cellular or Open Beam)
- Steel Roof Deck
- Acoustical and Troffer Forms
- Acoustical Metal Walls, Partitions, and Roof Deck

CONSTRUCTION SERVICES

- Structural Steel—Fabrication and Erection
- Steel Fabrication—Weldments
- Geodesic Domes—Fabrication and Erection

THE R. C. MAHON COMPANY *DETROIT 34, MICHIGAN*

MANUFACTURING PLANTS—Detroit, Michigan and Torrance, California
SALES-ENGINEERING OFFICES—Detroit, New York, Chicago, Cleveland, San Francisco and Torrance, Calif. and E. Orange, N. J.
REPRESENTATIVES IN ALL PRINCIPAL CITIES.

MAHON

WRITE FOR ROLLING DOOR CATALOG G-61—ALSO IN SWEET'S FILES.

Circle 604 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

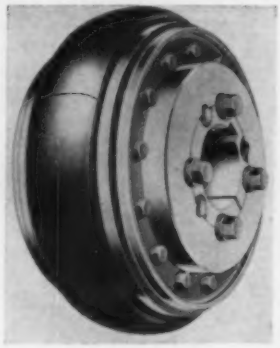
(Begins on page 180)

surface—a concentration of 1 or 2 oz per gallon of warm water is recommended. The all-purpose cleaner contains surfactants, grease solvents, alkaline cleaners, corrosion inhibitors and water conditioners. It is formulated to dissolve soil residues, grease and dirt, but is mild enough for washing hands when mixed with water. CalClean is reported most effective when applied with a suitable compressed air sprayer. Calgon Co., Div., Hagan Chemicals & Controls, Inc.

For details, circle 10 on Post Card

GIANT COUPLING for the high torque applications

Largest in company's Para-flex line of flexible cushion couplings is the PX280. It has more than twice the torque capacity of the next smaller



size and features the standard tire-shaped flexing element to accommodate angular and parallel shaft misalignment, and to absorb end float, shock and vibration. The PX280 will handle 400 hp per 100 rpm; its capacity at maximum recommended speed of 910 rpm is 3640 hp. Available from stock with Taper-Lock bushings for shafts up to 7-in. diam, it may also be had bored-to-size for shafts up to 9 in. Dodge Mfg. Corp.

For details, circle 11 on Post Card

BAR HANGERS expand to solve mounting problems

Type SX Expandable Bar Hangers have stamped-in prongs with concealed points, which function as studding nails at each end of the bar, are tapped into the studding. Regular nails then secure the installation. The hangers come in two types. An economy, clip type has a self-centering clip held in with a captive screw. The knock-out hole of the

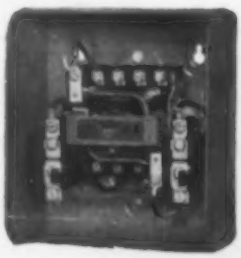
FAST CONTACT INSPECTION

QUICK COIL CHANGE

EASY CONTACT CHANGE

Putting it Bluntly... No Other Magnetic Starter is This Easy to Maintain

In just 10 seconds you can inspect contacts of the General Electric magnetic starter (left photo). You don't even need a screwdriver. Just remove two coil retainers, and lift out entire magnet and movable contact assembly. Also you can convert movable contacts from normally open to normally closed without tools (center), and fixed contacts by removing just one easily accessible screw per contact. Coil change also takes less than a minute (right). You can start benefiting now from these "easy maintenance" features of G-E magnetic starters. Just ask your General Electric sales engineer or distributor, or write for Publication GEA-7020. General Electric Co., Section 813-31, Schenectady, N. Y.



Progress Is Our Most Important Product

GENERAL ELECTRIC

Circle 605 on postcard, page 33

Now—A *unitized* power pack for *maintenance free* switchgear tripping and control!

Utilities and industrial plants can greatly increase their margin of reliability and protection for switchgear and control equipment by using C & D's *AutoCal** *unitized* Power-Pack.

Here's a dependable, high-capacity power package specifically built for tripping and control that pairs a simple, compact, C & D *AutoReg*® Silicon charger with powerful, lead-calcium grid control batteries. No adjustment or manual switching is required.

The charger is a completely automatic, constant voltage, current limiting unit. It regulates DC output voltage within ±1% in floating range over an AC input variation of ±10%. The silicon rectifying element has no known aging characteristics. Consequently, there are no aging taps and the attendant adjustment of these is eliminated. *AutoCal* has no moving parts and it utilizes a standard 115 volt, 60-cycle, single phase outlet as a power source.

PlastiCal® batteries** have extra thick positive plates (0.266"). They provide a high one minute rate. Lead calcium grid batteries require 1/5 to 1/10 as much current to maintain a fully charged condition as do conventional batteries. Consequently, there is so little electrolysis of water occurring that the batteries need be watered only once a year.

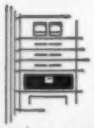
The combination of a C & D *AutoReg* charger and *PlastiCal* battery gives you self-protected charging . . . instantaneous peak power on demand . . . and long trouble free life.

Get the full details—write for Bulletin AR-102 today!

CHOICE OF MOUNTINGS

CUBICLE MOUNTING. Most popular method mounts *AutoCal* on the door of associated breaker cubicle.

WALL MOUNTING. Charger may be wall mounted near bank of indoor switchgear.



RELAY RACK MOUNTING. Charger is available with front panel for standard 19" relay rack.

WEATHER-PROOF OUTDOOR MOUNTING. Both charger and batteries fit in a weather-proof cabinet for use with outdoor switchgear.

C&D BATTERIES
of Conshohocken, Pa.... Attica, Ind.
DIV. THE ELECTRIC AUTOLITE CO.

Manufacturers of Slyver-Clad® Industrial Batteries • PlastiCell* and PlastiCal® Batteries for Communications, Control, and Auxiliary Power • Producers of AutoReg® Silicon Chargers and AutoCal* Charger-Battery Combinations

**Trademark, C & D Batteries Div. The Electric Autolite Co.*
***Designed for 25 year life*

Circle 606 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

outlet box is slid over the clip and tightened. The stud type has a positive-locking, two-piece ⅜-in. fixture stud which attaches through the knock-out hole. Either clip or stud may be set at any position over the full length of the bar hanger. Both types engage outlet box to expandable bar making the unit permanently tight. Two adjustable lengths are available: 14 to 18 in. and 18 to 26 in. Both types come in sets with outlet boxes. Bulletin TOB-161 gives data. Appleton Electric Co.

For details, circle 12 on Post Card

SAFETY LADDER gets up closer to work

Model K has a caster mounted base that can roll under desks and machinery—letting the upper portion of the ladder clear these obstacles and enab-

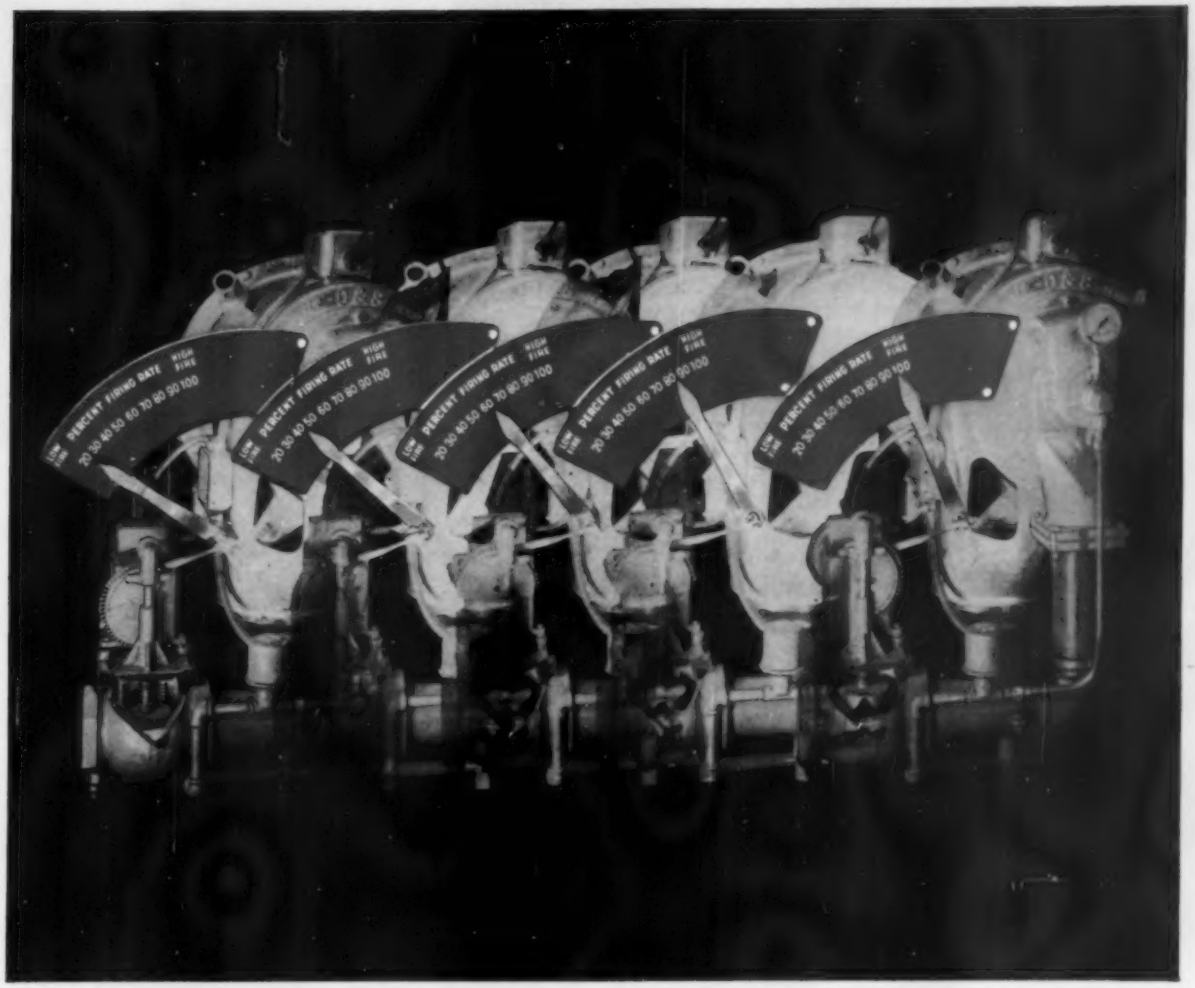
ling the user to be closer to his work. Of welded steel cantilever construction which provides an overhang without sacrifice of support, this safety ladder also features a locking device to anchor it to the floor when in use. The user's weight applied to the first step retracts the front casters and places rubber-tipped anchor legs on the ground. Model K comes in eight- to 12-step sizes. The Ballymore Co.

For details, circle 13 on Post Card

ANTI-STATIC FLUID for plastic-faced instruments

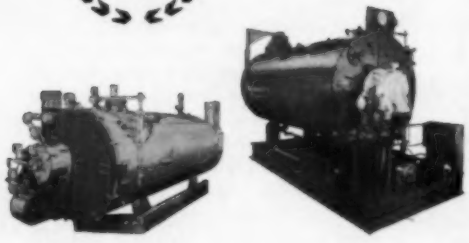
Statnul acts to prevent build-up of static charges on plastic-faced instruments, providing a thin transparent coating which drains off static electricity. Unlike anti-static agents requiring a relatively high percentage of atmospheric moisture to provide a conductor for static charges, Statnul is said to retain anti-static properties even under dry conditions. An active factor in the fluid is a long-chain mole-

FROM THE WORLD LEADER IN PACKAGED AUTOMATIC BOILERS AND BURNERS



Why *Powermaster*® returns your original investment faster

BUILDERS OF BETTER BOILERS SINCE 1885



One reason is its exclusive 5 to 1 turndown. Another feature gives you the same low percentage of excess air (2.8% O_2) and high percentage of CO_2 (13.5%)—at *all* loads, from 20% to 100% of capacity.

High constant efficiency at every operating load means immediate and impressive savings in fuel, maintenance and man hours.

Before you buy any boiler, it will pay you to investigate the many *other* extras that make *Powermaster* the "most engineering endorsed" packaged boiler in the world. Call your nearest O&S representative or write for Bulletin 1260.

ORR & SEMBOWER, INC.

840 Morgantown Road

Reading, Pa. • Since 1885

Powermaster®

PACKAGED AUTOMATIC BOILERS

Circle 607 on postcard, page 33

TANK CONTENTS AT-A-GLANCE with Dial-Type Liquidometer Gauges

For added assurance of accurate liquid quantity record keeping, specify easy-to-read Liquidometer gauges. Positive dial-and-pointer type indicators help to prevent erroneous readings . . . speed record keeping by showing tank contents at-a-glance.

Liquidometer gauges are available to measure and indicate virtually any liquid – at the tank site or remotely. Also available: integral or separate liquid level switches for automatic level warning or control. Float, hydrostatic, electric, or electronic operation can be supplied to meet your specific needs.

Let Liquidometer's forty years of experience in liquid level gauging and control work for you. Write for latest literature.

LIQUIDOMETER INSTRUMENTS

THE LIQUIDOMETER CORP.

Dept. B., LONG ISLAND CITY 1, NEW YORK

Circle 608 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

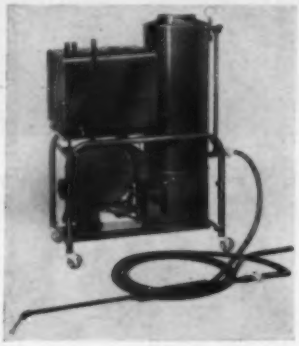
cule attractive to plastic materials on one end. The other end of the chain consists of an ion (+) link which provides a conductor independent of moisture. Statnul also provides a cleaning and polishing action. It is supplied in squeeze bottles and impregnated cloths. Weston Instruments Div., Daystrom, Inc.

For details, circle 14 on Post Card

Use the Reader Service Cards provided on pages 33-34 to ask for more information on this equipment. Circle item numbers of products in which you are interested.

STEAM CLEANER for the limited cleaning jobs

Model 100 is intended for operations with limited cleaning requirements, or for larger ones requiring an auxiliary or standby which can be easily moved about. Pressure range, 60 to 100 lb,



is the same as most larger cleaners. A non-fluctuating control is incorporated to maintain pressure to within ±1 lb of setting. Among several "big-cleaner" features built into this oil-fired unit are an atomizing burner providing complete combustion, and an orifice-in-nozzle which develops a straight-ahead cleaning stream without fogging. Model 100 is caster mounted, measures only 53 in. high; it costs around $525. Malsbary Mfg. Co.

For details, circle 15 on Post Card

EPOXY COATING protects asphalt, concrete surfaces

Pro-Seal 830 is described as an equal part epoxy coating resistant to oil, grease, gasoline, salt solutions and

This compact Package Air Preheater is being installed on a 150,000 lb/hr boiler at Olin Mathieson Chemical Corp.'s Brandenburg, Kentucky, petrochemical plant. When in operation it will recover enough heat from the boiler exhaust to increase efficiency of the boiler between 8% and 9%.

OLIN MATHIESON RECOVERS 360°F FROM BOILER EXHAUST WITH 11½′ x 11′ x 8′ PREASSEMBLED LJUNGSTROM® PACKAGE AIR PREHEATER

Olin Mathieson specified a Ljungstrom Package Air Preheater because it saves space as well as fuel. Mathieson's Ljungstrom occupies only about 1000 cubic feet, but cuts boiler exhaust temperature from 680°F to 320°F — puts 360° of heat back to work in the boiler.

The compact preassembled Package Air Preheater is ready to run when it's delivered—just connect to the power line and ducts, and it's on-stream. You make big savings on installation because there's no on-the-spot erection.

You can use a Ljungstrom Package Air Preheater on boilers from 25,000 to 250,000 pounds of steam per hour. For more information, write today for your free copy of a 14-page booklet.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

Circle 609 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

water. The material is an anti-skid coating and also has good resistance to weathering and abrasion. It is a 100 per cent solids material that may be sand loaded for filling spalled areas. Application time is 30 to 45 min, with an 8-hr cure time at 77 F for moderate use. Coverage is 100 to 125 sq ft per gallon, depending on surface conditions and application method. Coast Pro-Seal & Mfg. Co.

For details, circle 16 on Post Card

GLASS COATING keeps out sun heat and glare

Sun-Barr is formulated to control sun fading, glare and heat; it is available in 11 colored tints, each possessing its own sun control features. Manufacturer points out that because Sun-Barr controls infrared and ultraviolet as well as visible light rays, it helps to reduce fading and air conditioning costs. Applied by a special machine, the liquid is flow-coated on existing glass windows and areas. Once coated, these surfaces require only normal maintenance. Lightfastness is reported to last for several years without discoloration. National Glass Tinting Co.

For details, circle 17 on Post Card

TEXTILE MOTOR has all-around lint protection

Type JG is a fan-cooled totally-enclosed motor in ratings from 1 to 50 hp, speeds 720 to 1800 rpm. Besides keeping lint out of the motor, this design is claimed to eliminate build-up of lint on external surfaces. Large aluminum fan blades provide maximum air circulation around the motor by means of large, smooth air vents encircling the case. Also, the rubber surface is said to dissipate heat 50 per cent faster than a smooth surface. Intake ports are contoured to minimize air restrictions and permit low intake velocity, while preventing turbulence. Lubriflush lubrication is utilized via grease fill and drain passage drilled through the castings. Type JG Motor is available in three- or two-phase, 60 cycles, 220/440 or 550 v, rated for a 55 C rise. U. S. Electrical Motors Inc.

For details, circle 18 on Post Card

PACKING of compressed asbestos, synthetic rubber

Improved K&M Style 340 is announced as a standard, multi-purpose sheet packing material of the type formerly available only in premium grade packings. It is reported suitable for sealing against steam, water, petroleum oils, refinery gases, hydrocarbons. Keasbey & Mattison Co.

For details, circle 19 on Post Card

OVERHEAD CRANES utilize "upper space" profitably

Improved electronic controls and pressurized "walk in" passageway are design innovations of this overhead traveling crane—intended for use where capacity demands are highest, area requirements largest, and work conditions the most adverse. Under these conditions, the system reduces original cost and requires about 75 per cent less maintenance, manufacturer states; and the long-run production capacity will be more than 200 per cent of that available with conventional equipment. The crane is suited for corrosive or abrasive atmospheres, dock-side operations where salt water corrosion is a problem, and wherever atmosphere damages electrical relays and sensitive components.

In this crane, the interior of the main girder is used as a well-lighted corridor where strategic controls and components are located and maintenance crews can work. Interior aisles of two initial installations are 8 ft high, 5 ft wide and almost the full length of the 120-ft girders. For protection against outside atmospheres, each passageway is pressurized by a blower which forces in filtered air. Electrical panels and control equipment are mounted against the interior walls and a hoist, suspended from an I-beam track in the ceiling, handles

G-B SNAP*ON DISTRIBUTORS

AKRON, Ohio, The Asbestos Supply Co.
ALBANY, Ga., Industry Insulation Co.
ALBANY, N. Y., Hudson Valley Asbestos Corp.
ALBUQUERQUE, N. M., Mt. States Insulation Co.
AMARILLO, Tex., McDonald Engineering & Insulating Co.
ATLANTA, Ga., Reynolds Aluminum Supply Co.
Parker-Rice Insulation Co.
AUSTIN, Tex., Cinbar Engineering Co.
BALTIMORE, Md., Leroy Insulation Co.
BANGOR, Me., Eastern Glass Co.
BATON ROUGE, La., Eagle Asbestos & Packing Co.
BEAUMONT, Tex., Coburn Supply Co., Inc.
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CHARLOTTE, N. C., D & B Insulation Co.
CHICAGO, Ill., E. C. Carlson Co.
Culberg Asbestos & Cork Co.
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GREENSBORO, N. C., Starr Davis Co., Inc.
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HONOLULU, Hawaii, Parker Fallis Insulation Co., Inc.
HOUSTON, Tex., Precision Insulation Co.
INDIANAPOLIS, Ind., Lyon Lumber & Supply Co.
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Eckles Distributors, Inc.
Reynolds Aluminum Supply Co.
JOPLIN, Mo., Joplin Cement Co.
KANSAS CITY, Mo., Central Supply Co.
Insulation & Acoustical Specialties, Inc.
Kelley Asbestos Prod.
KEWANEE, Ill., Mechanical Insulation Co., Inc.
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LAKE CHARLES, La., Coburn Supply Co., Inc.
Solar Supply Co.
LOS ANGELES, Calif., Accurate Insulation Co., Inc.
Western Fibrous Glass Products Co.
LOUISVILLE, Ky., General Insulation & Roofing Co.
MACON, Ga., Industry Insulation Co.
MARIETTA, Ohio, Asbestos & Insulating Co.
MEMPHIS, Tenn., Gibbons Supply Co.
MIAMI, Fla., Reynolds Aluminum Supply Co.
Southern Metal Products Co.
MILWAUKEE, Wisc., F. R. Dengel Co.
MINNEAPOLIS, Minn., Asbestos Products, Inc.
MOORHEAD, Minn., Fargo-Moorhead Insulation Co.
NASHVILLE, Tenn., Reynolds Aluminum Supply Co.
NEWARK, N. J., Eastern Steam Specialty Co.
Robert A. Keasbey Co., Inc.
NEW ORLEANS, La., Eagle Asbestos & Packing Co.
NEW YORK, N. Y., Eastern Steam Specialty Co.
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ODESSA, Tex., Western Chemical & Supply Co.
OKLA. CITY, Okla., Ball Distributing & Engineering Co.
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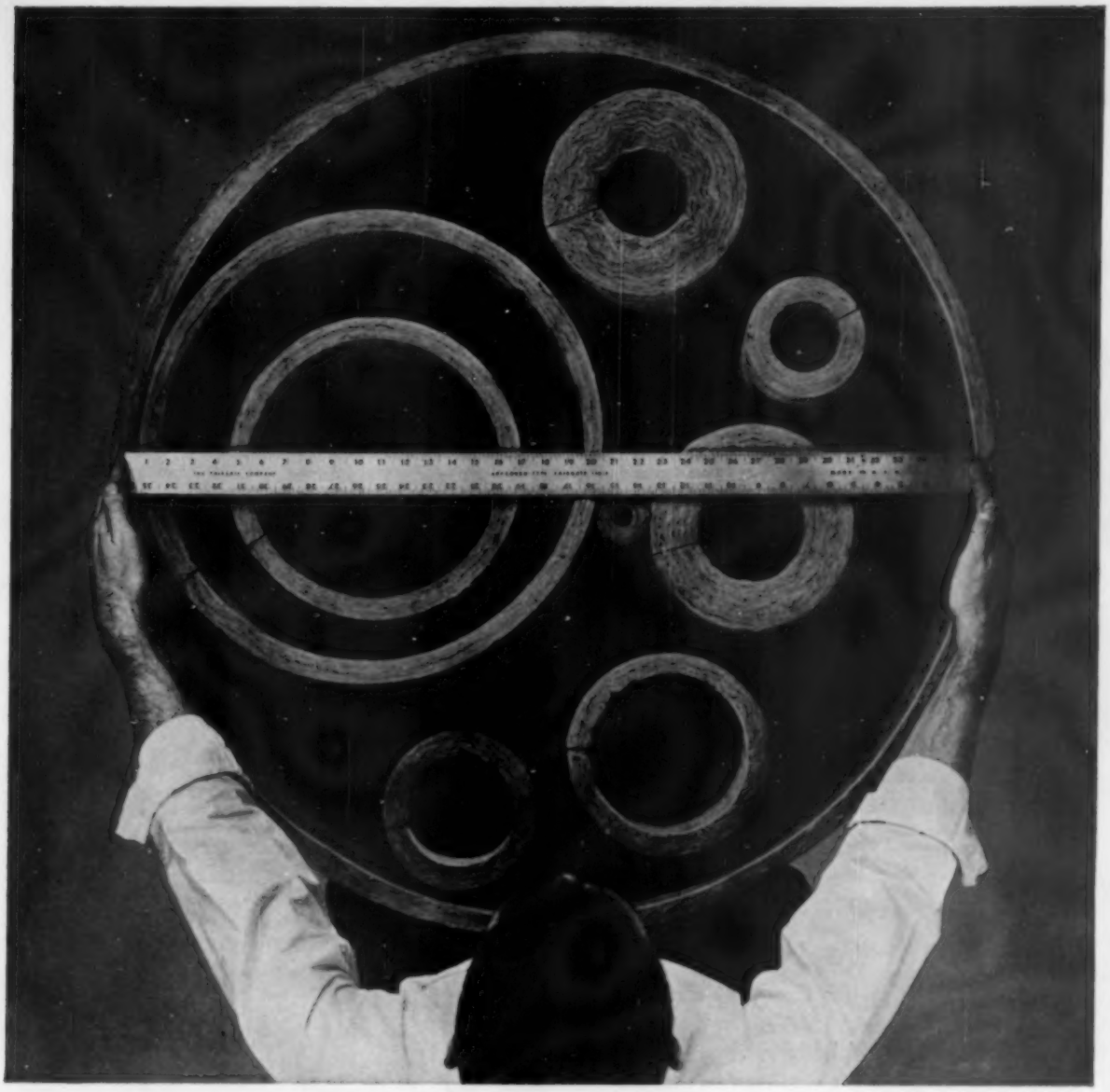
PADUCAH, Ky., Triangle Insulation Co.
PHILADELPHIA, Pa., John F. Scanlan, Inc.
PHOENIX, Ariz., Williams Insulation Co.
PITTSBURGH, Pa., Drawo Corp., Keystone Div.
PORTLAND, Me., Eastern Glass Co.
PORTLAND, Ore., Western Fibrous Glass Products Co.
RALEIGH, N. C., Reynolds Aluminum Supply Co.
RAPID CITY, S. D., Robbins & Stearns Wholesale
RICHMOND, Va., Reynolds Aluminum Supply Co.
ROANOKE, Va., C. E. Thurston Co.
ROCHESTER, N. Y., J. F. Burnett, Jr., Inc.
ROCKFORD, Ill., Mott Brothers Co.
SACRAMENTO, Calif., The Brookman Co.
SALT LAKE CITY, Utah, Bullough Asbestos Sup. Co.
SAN ANTONIO, Tex., San Antonio Machine & Supply Co.
SAN DIEGO, Calif., Western Fibrous Glass Products Co.
SAN FRANCISCO, Calif., Western Fibrous Glass Prod. Co.
The Brookman Co.
SAVANNAH, Ga., Baker Bros., Inc.; The Brower Co.
Reynolds Aluminum Supply Co.
SEATTLE, Wash., Western Fibrous Glass Products Co.
SHREVEPORT, La., Frith Sales Co.
SOMERVILLE, Mass., Insulation Products, Inc.
ST. LOUIS, Mo., Refrigeration Supplies, Inc.
The Stovey Company, Inc.
ST. PAUL, Minn., Asbestos Products, Inc.
SYRACUSE, N. Y., Burnett Process, Inc.
TALLAHASSEE, Fla., Baker Bros., Inc.
TAMPA, Fla., Eagle Roofing & Art Metal Works, Inc.
TULSA, Okla., Ball Distributing & Engr. Co.
TUPELO, Miss., Paine Supply Co.
VALDOSTA, Ga., Baker Bros., Inc.
WASHINGTON, D. C., Walter E. Campbell Co., Inc.
WAYCROSS, Ga., Baker Bros., Inc.
WEST PALM BEACH, Fla., Southern Metal Prod.
WICHITA, Kans., Wichita Sheet Metal, Inc.
4-27-61



G-B SNAP•ON® is the only one-piece pipe insulation available in sizes from copper tubing to 36" IPS

Only G-B Snap•On offers you all the time-saving, cost-cutting advantages of a one-piece glass fiber pipe covering for pipe sizes from copper tubing all the way up to 36" IPS. With G-B Snap•On's snap-hinge action, you can cut installation time up to 50% on virtually every pipe insulating job—and even more on the larger pipe diameters. It's available in 3′ sections, plain or with a wide variety of factory-adhered jackets for sub-zero to 350° F. piping—indoors or out, and in 6′ sections without jackets.

More often than not, G-B Snap•On requires less thickness than other pipe coverings to provide equal or superior insulating efficiency—another feature that saves you money. Permanent as glass itself, G-B Snap•On does not rot, corrode or otherwise deteriorate. Write for complete information today.

GUSTIN-BACON Mfg. Co. GUSTIN gb BACON

232 W. 10th St., Kansas City, Mo.

Thermal and acoustical glass fiber insulations • Molded glass fiber pipe insulation • Couplings and fittings for plain and grooved end pipe

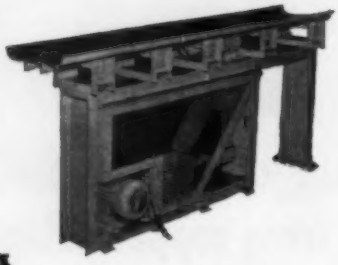
Circle 610 on postcard, page 33

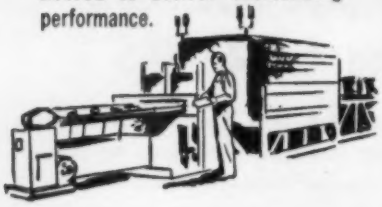
WHIZZING LUGGAGE ALONG AT 300 FEET PER MINUTE . . .
OR INCHING FORGINGS FORWARD AT 300 FEET PER HOUR . . .

Unique traveling diverter delivers luggage to claiming counter at the end of the incoming conveyer lines at United Air Lines' bright new terminal at New York's Idlewild International Airport.

IT'S ALL IN A DAY'S WORK FOR MATHEWS ENGINEERS

Whether it's a high-speed belt conveyer system smoothly handling the luggage of modern air travelers, or a **LIVE-FLO** oscillating conveyer upon which small parts are quietly but surely creeping along, you can be sure that it's **Mathews engineered** to deliver outstanding performance.





A new concept in oscillating conveyers—LIVE-FLO—is without equal where slow speed and complete control are important

MATHEWS CONVEYER COMPANY

GENERAL OFFICES . . . . . ELLWOOD CITY, PENNSYLVANIA
PACIFIC COAST DIV. . . . MATHEWS CONVEYER COMPANY WEST COAST, SAN CARLOS, CALIFORNIA
CANADIAN DIVISION . MATHEWS CONVEYER COMPANY, LTD., PORT HOPE, ONTARIO.

MATHEWS

Over Fifty Years of Leadership in Mechanized Handling

Circle 611 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

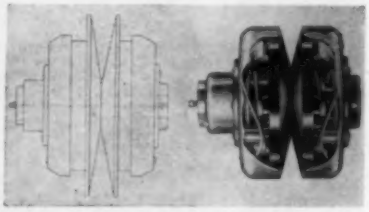
(Begins on page 180)

heavy equipment inside the girder and elevates tools through a dustproof hatch from the main floor below. Harnischfeger Corp.

For details, circle 20 on Post Card

VARI-SPEED PULLEYS with cam control design

These wide V-belt pulleys rated 1 to 5 hp at 1750 rpm feature cam control design for greater efficiency. Each pulley face is independently actuated by its



own spring and cam assemblies. Opposite wedging action of each cam and cam follower prevents pulley spread, company says, assures constant speed and compensates for tension and alignment of belt. Listed as Models 1060, 1280, 1390 and 1590, pulleys use No. 087, 12 or 14 top-width variable speed belts. Standard bore sizes are from $\frac{5}{8}$ to $1\frac{3}{8}$ in. and keyways $\frac{3}{16}$ by $\frac{3}{32}$ and $\frac{1}{4}$ by $\frac{1}{8}$ in. Hi-Lo Mfg. Co.

For details, circle 21 on Post Card

GAS SCRUBBER offers low liquid carryover

Fig. 4014, an ejector-venturi gas scrubber-separator combining company's SK Liquid Jet Gas Scrubber with a new separator, is claimed to provide higher efficiency and give less liquid carryover. The unit shown comprises a gas scrubber mounted on the separator. In the scrubber, water or other liquid under pressure, enters through a spray nozzle. Velocity of the liquid spray creates a draft in the chamber of the scrubber and causes gases to be drawn into the chamber and the venturi, where mixing of liquid with gases occurs. Entrained gas particle and liquid discharge into the separator and clean air issues to atmosphere.

The separator separates non-condensable gas from liquid and reduces liquid carryover as much as 98 per cent over gravity-type separators. Service tests are reported to show a final moisture content at separator outlet of 0.00002 gal per 100 cfm. Compared with the gravity types it is unusually

Circle 612 on postcard, page 33 →

This equipment package—
including bus duct, switchboard,
transformers, safety switches,
panelboards—was furnished by one
Westinghouse electrical wholesaler.
You can enjoy the same complete service.

Westinghouse

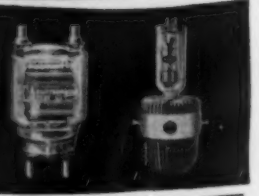
J-94167

AT YOUR SERVICE FOR INDUSTRIAL POWER!

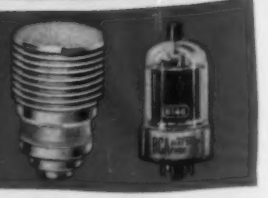
RCA THYRATRONS High- and low-power types for control of welding power sources, motors and other equipment.

RCA RECTIFIERS Vacuum, gas, and mercury-vapor types in a wide choice of power ratings for industrial uses.

RCA POWER TUBES For long, dependable heavy-duty service in electronic heating systems and similar applications.

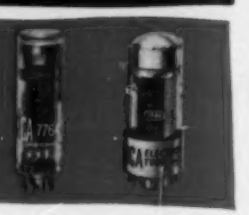


RCA BEAM POWER TUBES For long-life and dependable performance in mobile and industrial two-way radio applications.



RCA PHOTOTUBES AND PHOTOCELLS For long-life and dependable performance in counting circuits and other light-actuated industrial equipment.

RCA PHOTOMULTIPLIERS For industrial and laboratory applications requiring extreme photo sensitivity and speed of response.



You take no chances when you replace with RCA industrial tubes. Every single tube, before leaving our plant, is aged and tested for major electrical characteristics. A tube failing a single test is automatically rejected and destroyed.

For additional information, call your RCA Industrial Tube Distributor.
RCA Electron Tube Division, Harrison, N. J.

RCA
The Most Trusted Name in Electronics
RADIO CORPORATION OF AMERICA

Circle 613 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

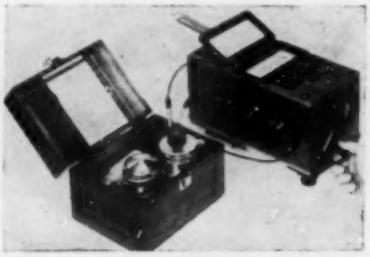
(Begins on page 180)

small, and its overall cost is described as low. Schutte and Koerting Co.

For details, circle 22 on Post Card

TEST CELL KIT for measuring resistivity of liquids

Offered for use with a Megger insulation tester in measuring resistivity of such liquids as transil oil and insulating varnishes, the Biddle-Balsbaugh Cell is packaged as a kit with a jar for storing the cell while not in use.



The jar holds appropriate solvents and a spring fixture for securing the cell when it is immersed in the solvent between tests. An aluminum beaker and polyethylene-coated paper cups are provided. Three test leads supplied have insulation for test voltages up to 5000 v d-c. For maximum cell protection, the kit is contained in a sturdy case with carrying handle. James G. Biddle Co.

For details, circle 23 on Post Card

INTERLOCKS cut current when door is opened

These interlock switches automatically cut current when the door of a cabinet or enclosure containing dangerous electrical equipment is opened. When the door is closed, interlock automatically re-energizes circuit. For electrical checkouts, interlocks can be set to a maintained-contact position, eliminating need for jumpers. When the door is closed, the interlock returns to its regular position, and the next time the door is opened, power is cut.

Three new series are available in limited quantities. The 13AC1 series —priced around $5.50—is designed for data processing consoles, transmitters and computers, since it eliminates even momentary power interruptions when cabinet door is closed. Up to four separate single-pole double-throw circuits can be controlled at once with the 8AC1 series, costing around $16.00.

Circle 614 on postcard, page 33 ➔

JANITROL

presents the new and versatile

52 series

AIR-COOLED
AIR-CONDITIONER

A PRACTICAL APPROACH TO ECONOMICAL,
HIGH EFFICIENCY COOLING FOR COMMERCIAL—
INDUSTRIAL BUILDINGS . . .

advance designed for the sixties

NEW JANITROL 52 SERIES AIR COOLED AIR CONDITIONERS

Outwardly beautiful and pleasing to the eye, inwardly rugged and powerful, new Janitrol 52 Series units combine years-ahead styling and cooling performance . . . provide truly low-cost central cooling with matchless reliability and performance.

JANITROL'S ADVANCED DESIGN . . . A SAFEGUARD AGAINST PRODUCT OBSOLESCENCE!

The weatherproof, high-efficiency 52 Series condensing unit, containing all moving refrigeration parts, installs outside. Available in six basic capacities from 22,200 to 110,200 btu/hr.

Full A.R.I. certification: Every Janitrol unit meets all standards of Air Conditioning and Refrigeration Institute.

STANDARDS OF EXCELLENCE . . .

In Performance—large condensing coils assure efficient operation with outdoor temperatures up to 125°F!

In Styling—crisp, modern lines distinguish the new 52 Series. Cabinets are finished in durable, automotive-type enamel.

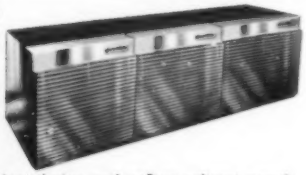
In Economy—The top-mounted fan bathes condensing coils in a jet stream of cooling air to raise efficiency and reduce current usage. Coils are shaded from the sun by louvers.

In Quietness—The powerful compressor is mounted on rubber-cushioned, resilient springs . . . cabinet is heated with special sound-deadening material.

In Safety—Complete overload and weather protection is provided. Enclosing grilles thoroughly safeguard children and pets.

In Servicing Ease—all components are easily accessible. Service panels can be removed without effecting operation during service checks.

MULTIPLE COMBINATIONS PROVIDE ECONOMICAL, HIGH CAPACITY COOLING



Modular cabinet design and upflow exhaust permit compact, multi-unit installations. Only the grilled, air-intake side of the cabinet requires clearance.

Any desired number of Janitrol 52 Series units may be installed together, with zero clearance between, to provide a variety of higher capacity combinations from 120,000 to over 1,000,000 btu/hr. Only Janitrol offers custom-built capacities at standard model cost!

JANITROL
year 'round conditioner

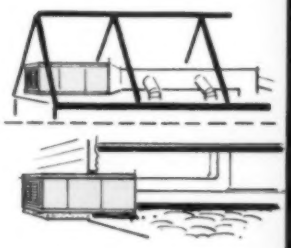
Combines quality gas heating and waterless cooling! Less than four sq. ft. of floor space needed for most installations. Features include famous Dura-Tube heat exchanger with 20-year warranty. Unique by-pass for correct air flow on heating or cooling cycle without adjustments. Powerful air-cooled 52 Series condensing unit. ADD-ON cooling—install for heating only, add cooling later.

ADD-ON COOLING

Adapts most any warm air furnace for thrifty, efficient central cooling. Cooling coil mounts in duct, attractive, air-cooled 52 Series unit goes outside. Powerful, quiet performance with outside temperatures to 125°F. Easy to install.

"J-LINE" self-contained conditioners

An economical solution for many cooling needs. One compact unit contains blower, compressor and coils. For use with ducts or as free discharge. Install through wall in crawl space, attic or other limited access locations.

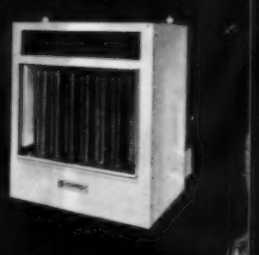


BLOWER-COIL UNITS

Smartly styled cabinet contains cooling coil and blower for use as free discharge or with ducts. Units are attached to ceiling to save floor space. Very quiet and efficient!

GAS-FIRED DUCT FURNACES

For installation in a duct where the air is circulated by a separate blower. Especially adaptable for industrial heating applications in combination with cooling. 73 Series in six sizes from 50,000 to 225,000 btu/hr. 72 Series in sizes 200,000 and 300,000 btu/hr. may be combined to provide unlimited capacity range.



JANITROL®
HEATING AND AIR CONDITIONING

MIDLAND-ROSS

A DIVISION OF MIDLAND-ROSS CORP. • COLUMBUS 16, OHIO
IN CANADA: MOFFAT HEATING & AIR CONDITIONING DIVISION
MOFFATS LTD., TORONTO 15

ALSO MAKERS OF SURFACE INDUSTRIAL FURNACES, KATHABAR HUMIDITY CONDITIONING, JANITROL RESIDENTIAL HEATING AND COOLING EQUIPMENT

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

In such applications, four sub-miniature switches are controlled by the actuating rod, and various on-off combinations can be made. A sealed interlock is available in the 9AC series at prices starting at around $13.00. Micro Switch Div., Minneapolis-Honeywell Regulator Co.

For details, circle 24 on Post Card

It's easy to obtain product data with the postage-free Reader Service Card provided on pages 33-34. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

TEMPERING VALVES for the large hot water systems

Water tempering valves in the No. 170 Series have bronze bodies, streamline water flow ways and high capacity.

With a 10-lb pressure drop, for example, the 1-in. size passes 31 gpm and the 1½-in. size, 44 gpm. Thermostatic elements are interchangeable in all five sizes. Watts Regulator Co.

For details, circle 25 on Post Card

TRANSFORMERS with greater overload capabilities

This lower and lighter oil-immersed line of Endur-All Distribution Transformers offers greater overload capabilities through larger cooling duct area, higher-temperature insulation, and higher temperature oil. Lower impedances permit users taking full advantage of overload capabilities. Locked core and coil assembly provides

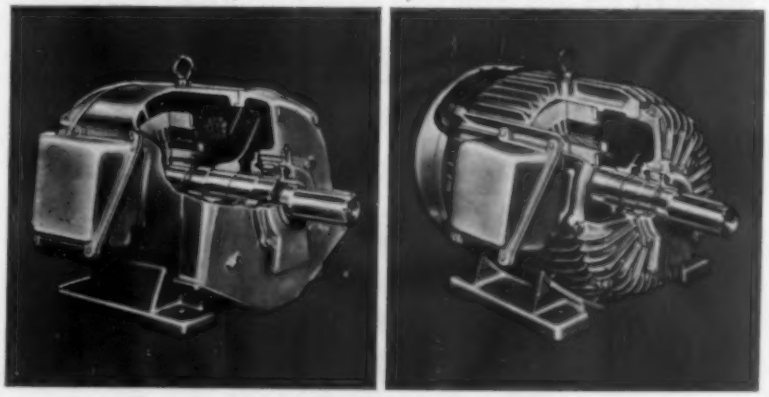
WHEN IT'S ON IT'S ON!

Take any Schorch Induction Motor. Switch it on. Instantly, you get full production power. Run your trouble-free Schorch for days, weeks, years . . . you'll continue to get the same reliable performance, even under difficult operating conditions. Built for the American market, Schorch motors exceed NEMA standards . . . from superior starting characteristics to top-notch performance at Class B temperatures. Humidity a problem? Schorch Drip-Proof Motors are moisture-guarded . . . sensitive operating parts treated with water and corrosion-resistant coatings. Dirt and dust a factor? Schorch Motors come completely enclosed . . . dirt cannot penetrate moving parts. And all precision Schorch motors feature compact, one-piece, cast-iron frames for reduced vibration . . . offer easy accessibility to operating parts for quick lubrication . . . are designed to minimize fatigue-producing noise. Schorch precision-quality motors are the result of over 75 years of development and perfection by one of the largest electrical factories in West Germany.

Complete range . . . all standard speeds. Large stocks and service throughout the United States. For information, write:

GEORG VON OPEL CORP.,

15 William Street, New York 5, New York • BO 9-5690



Circle 615 on postcard, page 33

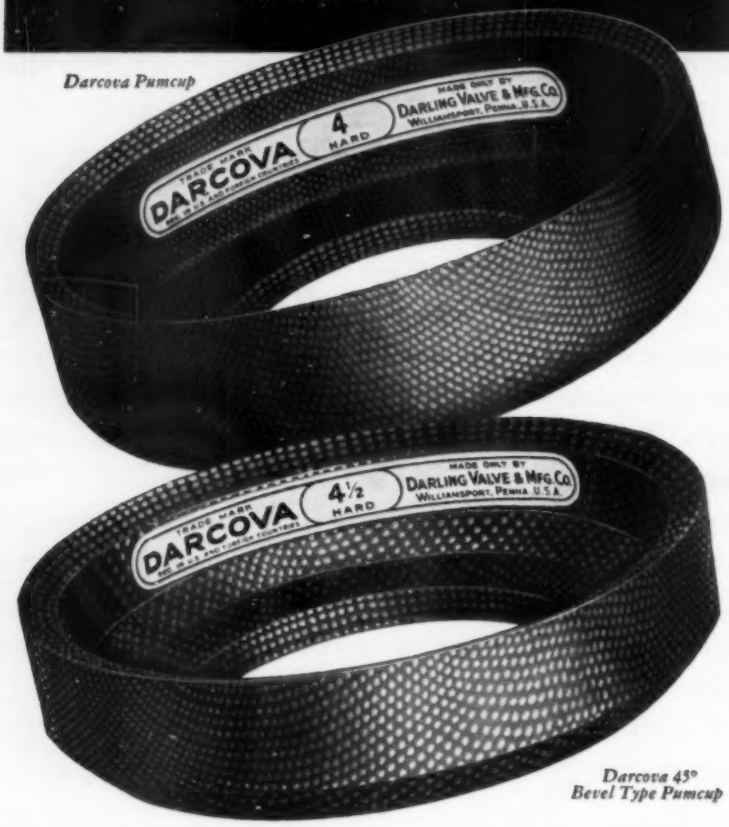
DARCOVA PUMCUPS

now available with

100% NYLON COMPOSITION

for HYDRAULIC CONTROLS, AIR CYLINDERS, RECIPROCATING PUMPS

Darcova Pumcup



Darcova 45° Bevel Type Pumcup

DARLING Pumcups—long noted for unequalled efficiency and life in all kinds of cylinders—are now greatly exceeding their own performance records! The new 100% Nylon Composition, available *only* in Darcova Pumcups, does it!

Nylon Pumcups are made in sizes, types and textures exactly right for your particular equipment—ready *now* to give you unprecedented piston packing performance!

Write for helpful data Bulletin No. 5903.

DARLING VALVE & MANUFACTURING CO.

Williamsport 14, Pa.

DARCOVA — THE ORIGINAL COMPOSITION CUP

TRADE MARK PUMCUPS

Circle 616 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

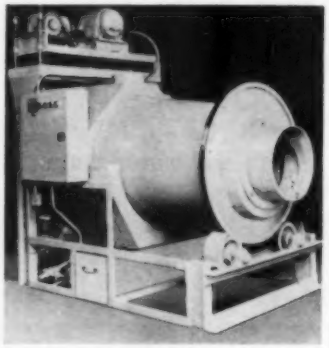
(Begins on page 180)

high short-circuit strength and does away with nuts, bolts and welds. High-gloss paint used on the transformers provides tough, durable finish. Allis-Chalmers Mfg. Co.

For details, circle 26 on Post Card

SAWDUST BARREL automates batch drying, polishing

Automatic control of tumbling cycles, automatic separation and media retention and automatic discharge of finished metal parts are features of this 36-in. sawdust barrel, the Honite. It is designed to minimize hand labor in batch drying and polishing operations; additional automation is afforded with

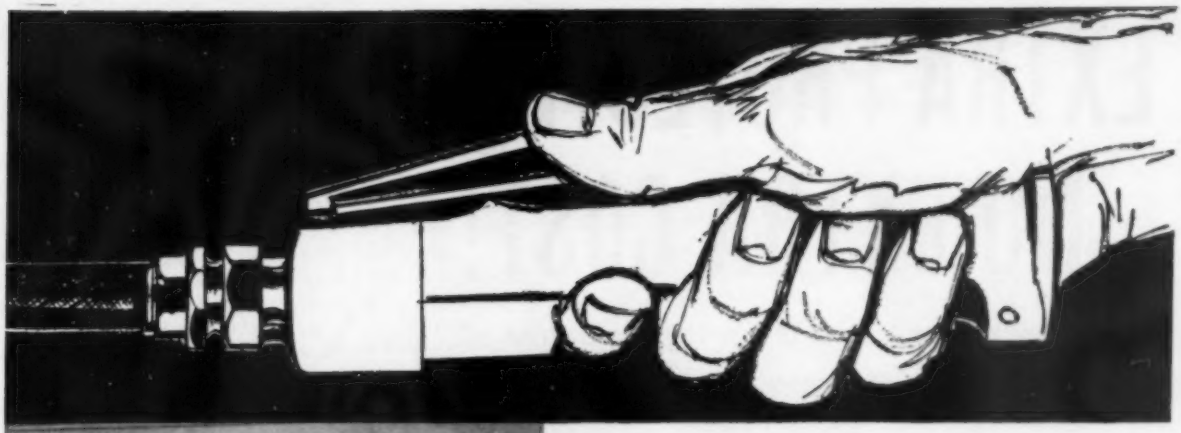


optional storage hopper and power loading equipment. Gas heats the drum. A metal hood retains the heat in the tumbling compartment. Parts are fed in one end, discharged at the other. Media remains in the barrel ready for reuse, or can be discharged automatically. A magnetic separator, standard equipment, can be replaced by a vibratory separator. Minnesota Mining and Mfg. Co.

For details, circle 27 on Post Card

HIGH FLOW FILTER stops dirt at hose end

Designed for "point of delivery" or nozzle-end hose and pipeline installations, the Turbomonitor contains a stainless steel cone-shaped wire cloth filter element providing 10-micron filtration at differential pressures to 150 psi. It is available in 10½-, 14½- and 17½-in. lengths for accommodating, at ambient temperatures, flow rates of 300, 360 and 720 gpm. It monitors effectiveness of existing "upstream" primary filter installations and provides a backstop to collect contaminant which may damage operating



ONE-HAND COMMAND

. . . of any lifting situation to 4000 pounds. Lightweight, easy-to-use Gardner-Denver air hoists do all the work—operator simply presses a lever to lift or lower at the speed he selects. Both piston and rotary types available from our complete line. Write for Section 86 bulletins.

GARDNER-DENVER AIR HOISTS:

- Can't spark
- Can't be damaged by overload stalls
- Can't burn out
- Protected from dirt, dust, moisture, corrosive fumes
- Maximum safety—powerful mechanical brake

GARDNER-DENVER Since 1859

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois—Offices in principal U.S., Canadian and Mexican cities
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Ave., Toronto 16, Ontario
International: Gardner-Denver International Division, 233 Broadway, New York 7, N.Y.

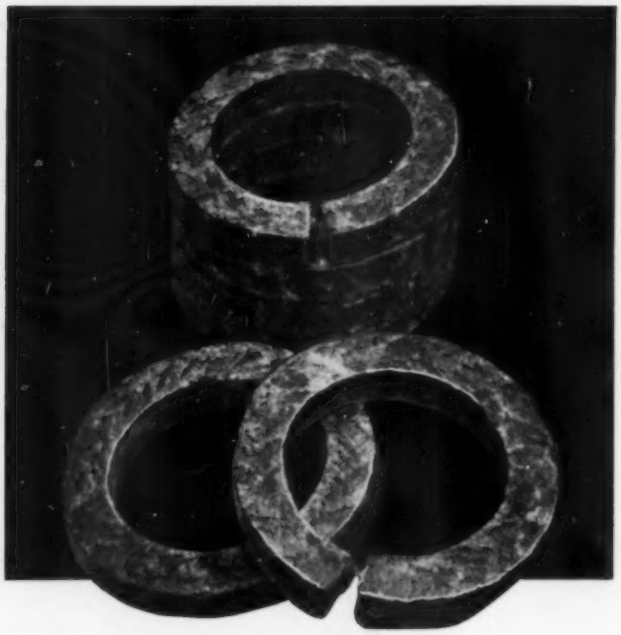
International Offices: Buenos Aires, Argentina; Artarmon, N.S.W. Australia; Brussels, Belgium; Rio de Janeiro, Brazil; Santiago, Chile; Barranquilla, Colombia; Lima, Peru; Ndola, N. Rhodesia; Salisbury, S. Rhodesia; Johannesburg, Transvaal

Circle 617 on postcard, page 33

EXTRA PROTECTION-NO EXTRA COST!

Now you can have the extra protection of CHEMPRO TEFLON at regular asbestos packing prices.

Special, exclusive fabrication process keeps costs low.



CHEMPRO *Teflon Suspensoid* IMPREGNATED ASBESTOS PACKINGS have the powerful chemical resistance of Teflon plus the strength and resiliency of high grade asbestos fiber. CHEMPRO Teflon "lubrication" is inert, permanent. It *stays in* the packing. Also protects the asbestos.

CHEMPRO STYLE No. 500 PACKING: 85% white asbestos yarn, square plaited and thoroughly impregnated with Teflon. Available on spools by the pound, in sizes from ⅛" up to 1" packing space. Also available in die-molded or mandril-cut rings or ring sets. Designed for valves, pumps and other process equipment handling hydrocarbons, light solvents, alcohol derivatives and other volatiles.

A slightly more expensive Chempro Packing, Style No. 600, consisting of Teflon-impregnated, square plaited 100% blue cape asbestos, is available for handling strong acids and caustics.

Write for Bulletin No. CP552 and Prices.

CHEMICAL & POWER PRODUCTS, INC.
7 Broadway, New York 4, N. Y.

The Original Fabricators of Teflon Packings and Gaskets

Circle 618 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

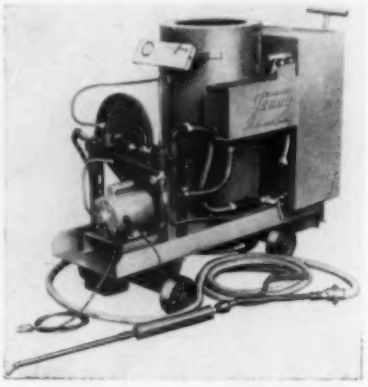
(Begins on page 180)

equipment downstream. Pressure drop is nominal, running 3 lb across stream on the smallest unit, 7 lb on the largest. Aluminum housing has 4-in. NPT female inlet and outlet connections. A stainless steel sleeve is provided to prevent galling between mating halves. Field maintenance involves only backflush. Purolator Products, Inc.

For details, circle 28 on Post Card

STEAM CLEANER makes tough cleaning jobs easier

Super powered, the 750 Series Hypressure Jenny features 100 gph pump capacity; an angle grip swivel gun with high-impact nozzle which literally blasts away grease and dirt, and lets operator work with less fatigue; solu-



tion metering controls; and automatic electric spark ignition. Optional accessories include a nozzle control for remote operation; low water cut-off to stop the unit automatically in case of water supply failure; and a cooling system cleaning attachment for reverse flushing automotive cooling systems. Portable and stationary models are available and there's a choice of oil or gas burner. The cleaner is painted green, is 48½ in. long, and weighs about 340 lb. Form 17-A-76 gives data. Homestead Valve Mfg. Co.

For details, circle 29 on Post Card

HIGH HEAT PAINT comes in 10 standard colors

Reported capable of withstanding up to 1700 F without blistering or burning, C-I Extra High Paints are composed of a clear silicone base blended with aluminum pigment. This combination air dries to a bright finish in about 30 min. Then when heated, it

THIS WORK-HORSE VALVE WILL SAVE YOU MONEY!

ACF Lubricated Plug Valve

You will save on purchase price and in operating costs with the ACF Lubricated Plug Valve. Thousands of others have done the same and are successfully using this versatile valve in chemical plants, sewage plants, paper mills, oil production, mining operations and steel mills . . . it's a long list of applications. A cylindrical plug — like a journal in a well-oiled bearing — can only rotate, can't wedge and can't unseat. The ACF Lubricated Plug Valve may be installed in any position, fits in the smallest possible space. It can be serviced quickly, requires little attention. The efficient lubrication system holds corrosion to a minimum. Send for Catalog 400, P. O. Box 2117, Houston 1, Texas.

WHEN SO MUCH DEPENDS ON A VALVE . . . SPECIFY W-K-M

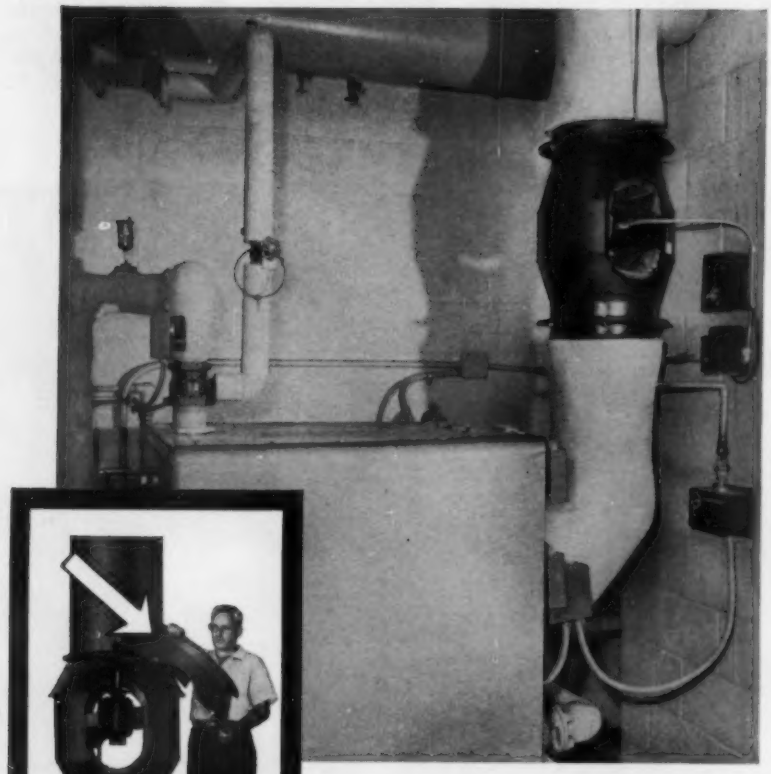
W-K-M DIVISION

ACF INDUSTRIES

Circle 619 on postcard, page 33

CUT MAINTENANCE COSTS

with this new design induced draft fan



US Patents 2898030 2978167

Entire half of cone comes off . . . not just an access door . . . exclusive feature

While the DE BOTHEZAT® Induced Draft Bifurcator® Fan **remains in the breeching,** the fan wheel, extension shaft and motor can be quickly inspected or removed! This new removable cone provides plenty of work space.

DEPENDABLE PERFORMANCE — Direct drive motor eliminates belt failure. Motor is mounted in separate insulated chamber . . . safe from fumes and heat. DE BOTHEZAT Fans are installed at any angle like a section of breeching or ductwork. This saves space and installation costs.

COMPLETE DRAFT FLEXIBILITY — DE BOTHEZAT Induced Draft Fans can be equipped with motor speed controllers that adjust fan speeds to exact boiler requirements. For details, mail coupon below.

De Bothezat®

Divisions of American Machine and Metals, Inc.

TROY LAUNDRY MACHINERY • RIEHLE TESTING MACHINES • DE BOTHEZAT FANS • TOLHURST CENTRIFUGALS • FILTRATION ENGINEERS FILTRATION FABRICS • NIAGARA FILTERS UNITED STATES GAUGE • AUTOBAR • AUTOMATIC DEVICES • LAMB ELECTRIC COMPANY • HUNTER SPRING COMPANY • GLASER-STEERS CORPORATION

DE BOTHEZAT FANS DIVISION, Dept. PE-661
American Machine and Metals, Inc.
East Moline, Illinois

Please rush literature on DE BOTHEZAT Induced Draft Bifurcator Fans with exclusive removable cone feature.

NAME

FIRM NAME

ADDRESS

CITY & ZONE STATE

Circle 620 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

is said to virtually fuse with the surface on which it is applied. It is especially suggested for temperatures in excess of 500. According to manufacturer, this paint forms a metal coating that resists moisture, corrosion, mild acids, alkalis and industrial fumes. It can be applied by brush, spray dip. Chem Industrial Co.

For details, circle 30 on Post Card

ONE-TIME FUSE offers high interrupting capacity

This one-time fuse with silver-plated contacts offers high interrupting capacity, long time delay, low watt loss

and predictable performance. It saves power because it runs up to 38 per cent cooler, company says, has up to seven times the delay of other types of fuses, and is designed to meet the safety requirements of ac-dc circuits. The Chase-Shawmut Co.

For details, circle 31 on Post Card

WHITE COATING protects the galvanized metal surfaces

Galvinoleum 1390 White may be brushed or sprayed directly on bare galvanized metal surfaces. It dries to a tough, durable semi-gloss said to last and last on gutters, downspouts, roofs, ductwork etc. It may also be applied to new, unpainted galvanized metal without etching or weathering of the surface. It may be tinted with colors-in-oil. Rust-Oleum Corp.

For details, circle 32 on Post Card

GAS HEATERS supply hot water in large amounts

Burkay B-197 and B-250 Heaters are automatic storage tank-type gas water heaters for small to medium-sized industrial applications. The B-197 will heat 166 gph at 100 F temperature rise and is rated at 197,000 Btu/hr input.

Circle 621 on postcard, page 33 →

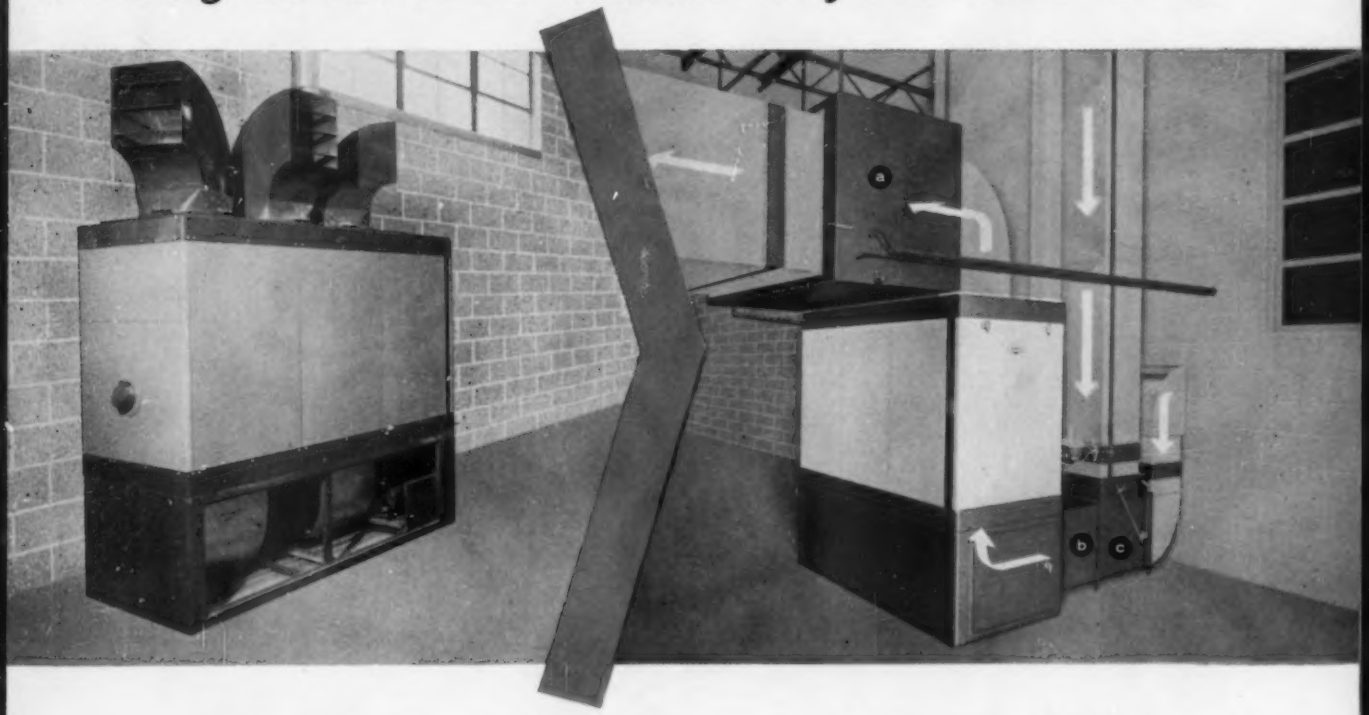
Inland 4-WAY®
Safety Plate
is easy
to fabricate
AVAILABLE FOR IMMEDIATE DELIVERY
FROM YOUR LOCAL STEEL SERVICE CENTER
INLAND STEEL COMPANY 30 W. Monroe St. - Chicago 3, Ill.
STEEL
SERVICE CENTER
INSTITUTE
INLAND

New from **LENNOX**

M-
This is great.
We installed these recently.
Management still amazed
at production increase.
J. W.

factory cooling

...using direct-fired heaters as your basic units



1. LENNOX DIRECT-FIRED SPACE HEATER—THE BASIC UNIT

Here's the unit you start with—the highly efficient Lennox OG4 industrial heater (gas, oil or combination). Absolute simplicity of design allows this stainless and aluminized steel unit to be applied in an upright, inverted or horizontal position. It can be installed for heating and ventilating needs now, with cooling easily added at a later date. Or, if you prefer, include the cooling coil in the initial installation.

2. ADD LENNOX COOLING COIL FOR YEAR 'ROUND PLANT COMFORT

Here you see how the cooling section (a), filter section (b) and mixing damper for outdoor air and return air (c), combine with the OG4 heater to provide year 'round cooling, heating and ventilating. The mixing damper can be controlled manually or automatically. Never before has an all-purpose line incorporated such versatility, ease of installation and maintenance, together with extreme efficiency and adaptability to widely varying heating, cooling and ventilating requirements.

For further information and a Lennox cooling survey (at no obligation), write LENNOX, 608 S. 12th Ave., Marshalltown, Iowa.
Circle 622 on postcard, page 33

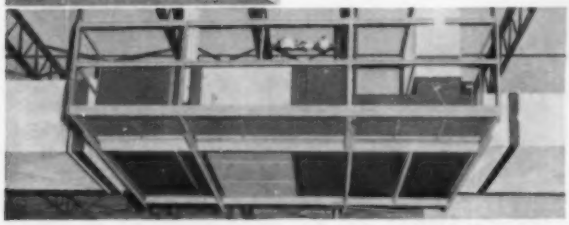
...increases factory production up to 28%

Air conditioning is justified if it only increases production 1½% to 3%

The benefits gained from factory cooling can, in most cases, make it a necessity. No one would expect employees to work in a cold building during the winter, so how can they be expected to work at full capacity in a hot one during summer? Once the advantages are weighed, factory cooling usually gains an overwhelming vote of approval from management. And, once *you* compare Lennox equipment with any other line, you'll see the reasons for the big switch to Lennox in industrial heating, cooling and ventilating.

MANY WAYS TO APPLY

Combined here are a Lennox down-flo OG4 central furnace, a cooling section, a filter section and a mixing damper for return and fresh air. The unit feeds a distribution perimeter loop buried in the concrete floor.



In this factory the OG4 has been combined with an evaporator section, filter section and damper for return and fresh air. It is suspended and has a service platform. This package closely controls temperature, humidity and make-up air all year.

Don't be satisfied with less than

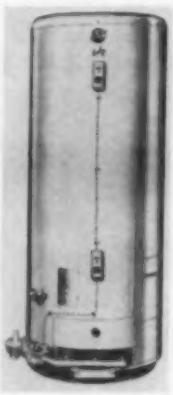
LENNOX

HEATS • COOLS • TREATS AND MOVES AIR

LENNOX INDUSTRIES INC., FOUNDED 1895 — MARSHALLTOWN AND DES MOINES, IOWA; COLUMBUS, OHIO; SYRACUSE, NEW YORK; DECATUR, GEORGIA; FT. WORTH, TEXAS; SALT LAKE CITY, UTAH; LOS ANGELES, CALIFORNIA. LENNOX INDUSTRIES (CANADA) LTD. — TORONTO, MONTREAL, CALGARY, VANCOUVER, WINNIPEG.

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)



The B-250 heats 210 gph at 100 F rise, is rated at 250,000 Btu/hr. Both have Permaglas glass-lined 100-gal tank and new-design burners. They have fully automatic controls with full safety shutoff, glass fiber insulation and aluminized steel peripheral flue liner to resist corrosion by flue gasses and prevent heat build-up. The heaters are shipped assembled. For installation as an automatic storage heater, with an auxiliary storage tank, as a booster, in multiple heater installations, in two-temperature installations, and as a pre-heater. Permaglas Div., A. O. Smith Corp.

For details, circle 33 on Post Card

ROOFING SHINGLES are sealed by sun's heat

Sol-Seal Shingles feature a "solar-sensitive" adhesive which bonds them "weather-tight" against winds, rain and snow. Yet, the shingles won't stick together in package, company notes, because of a protective tape on the underside of each shingle. For re-roofing and new construction, Sol-Seal three-tab 12-by 36-in. shingles are available in wide selection of colors. The Philip Carey Mfg. Co.

For details, circle 34 on Post Card

STEEL STRAPPERS have simplified mechanism

Steel strapping machines in the F7 series have a basic strapping mechanism described as the most compact and low cost developed. It is in side or top mounted position, so that installations can be custom adapted. The most simple system has the strapping mechanism side-mounted on a conveyor-height stand, and has controls for semi-automatic operation. Production line models have full package-circling tracks and controls for automatic strapping.

The mechanism is a self-contained, air powered and electrically controlled unit weighing about 75 lb, and is 26 in. long. It can be mounted on 12-in. centers. It contains pneumatic machinery for strap feed, take-up, cutting and sealing plus an integral magazine for 100 metal seals. It handles four strap widths from 3/8 to 3/4 in., operates on a minimum package face of 4 in., receives packages from right- or left-moving conveyor. Acme Steel Co.

For details, circle 35 on Post Card

CONCEALED SPRINKLERS serve hills or level areas

For automatic or manually controlled underground systems, Rotor Pop-Ups come in part or full circle models, the latter with single or two nozzle sprinklers. After watering, these units quietly disappear into the ground.

They are designed for installation flush with the ground. Rotor Pop-Ups have oscillating arm drive. A heavy-duty retractor spring utilized in the sliding pop-up member (shown in operating position) closes the sprinkler

NEW Snap-on

128-PAGE TOOL CATALOG

INDUSTRIAL WRENCHES ..... FOR USE ON
POWER NUT-RUNNERS AND IMPACT WRENCHES
INDUSTRIAL MAINTENANCE SET OF 255 Snap-on WRENCHES AND TOOLS
EXTRA HEAVY FOR TOUGH JOBS
PLIERS
DOUBLE OFFSET BOXOCKETS
COMBINATION WRENCHES
THE Snap-on TORQOMETER

send for your FREE copy

Here is a complete, 128-page hand and power tool buying guide for purchasing agents, engineers, production and maintenance officials — anyone concerned with the use of hand tools for assembly, maintenance, field service and original equipment repair kits.

Every type and size of tool is identified by number for quick, easy ordering. Important dimensions and specifications are clearly listed. Popular sizes of sockets and attachments designed expressly for powered nut runner and impact wrench use are included.

Also included is a complete range of automotive tools and shop equipment for fleet maintenance operations.

Ask the SNAP-ON Sales Engineer who calls at your plant for your FREE copy. Or write direct.

FOR ALL INDUSTRY

SNAP-ON TOOLS

8068-F 28th AVENUE • KENOSHA, WISCONSIN

Circle 623 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

when pressure is off, and the entire internal assembly is removable from the top without removing case from riser. National Rain Bird Sales & Engineering Corp. of Azusa.

For details, circle 36 on Post Card

ELECTICAL LIFT TRUCK for light industrial use

Model RST is designed to fulfill requirements for a compact light to medium capacity electric fork lift truck for light industry and boxcar loading-unloading. The 2,000-, 2,500- and

3,000-lb capacity truck is 33¾ in. wide for easy maneuverability in confined areas. With a 68-in. over-all height mast, it can stack loads 105 in. high in storage areas, or enter low door ways or trucks to unload supplies. The three-wheel truck has a rear wheel drive and steer that turns at right angle to load or front wheels. Foot-operated controls for lift, tilt, travel and braking, and four timed speeds are other features. Automatic Transportation Co.

For details, circle 37 on Post Card

Reader Service Post Cards for requesting more details on products described are provided on pages 33-34.

SPRAY BOOTHS DESIGNED for short production runs

Thrift-Flow, a water-wash paint spray booth designed for production-line economy and efficiency on short runs, uses nozzle sprays with overlapping patterns to achieve high-speed removal of paint pigments and volatiles. Panel-type construction is incorporated. The

THERE'S A JOHNS-MANVILLE SPECIFICATION FOR EVERY ROOF INCLINE

Dead level to ½" per ft.
AQUADAM
SMOOTH SURFACE ASBESTOS ROOFS

½" to 6" per ft.
FLEXSTONE
SMOOTH SURFACE ASBESTOS ROOFS

1" to 3" per ft.
ASPHALT GRAVEL SURFACE ROOFS

Dead level to 1" per ft.
AQUADAM GRAVEL SURFACE
BUILT-UP ROOFS

For deck inclines of dead level to 1" per foot:

AQUADAM® GRAVEL SURFACE BUILT-UP ROOFS

Whether gravel is applied by hand as shown below or by the mechanical method you see above... the key word to remember in quoting is AQUADAM. For gravel or slag-surfacing a roof incline of dead level to 1" per foot, over nailable or non-nailable decks, a J-M AQUADAM GRAVEL SURFACE BUILT-UP ROOF specification offers you many advantages.

That's because Aquadam is an unusual bitumen, especially developed by Johns-Manville for use on dead level and low incline roofs. It has exceptional adhesiveness to grip and hold the gravel or slag... and to bond the roofing felts together. Aquadam will wet and adhere to surfacing within a very generous temperature range, and has excellent self-sealing characteristics. Aquadam also offers superior resistance to rain, heat, cold and the thermal shock of sudden change.

You can always quote an AQUADAM GRAVEL SURFACE BUILT-UP ROOF with confidence. You can have equal confidence in the many other specifications available to you as an Approved Johns-Manville Contractor. And, if you come up against *any* specific problem, call your Johns-Manville Representative for free, expert advice. Or, write to Johns-Manville, Box 158, Dept.PE-6, New York 16, N.Y. In Canada: Port Credit, Ont. Cable: Johnmanvil.

JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

Circle 624 on postcard, page 33

HERC-ALLOY

THE ORIGINAL ALLOY STEEL CHAIN

Herc-Alloy has many superior features ...has high tensile strength...is lighter, therefore easier to handle... is long wearing...offers high resistance to impact loading...is INSWELL welded.

Herc-Alloy is sold in running lengths and in all types and sizes of sling chains assembled to customers' specifications. CM also produces a complete line of chain attachments and welded chain of all types including stainless steel.

● Write for Data Book covering Herc-Alloy Sling Chains, including helpful information on their assembly, care, use and inspection.

***Hammerlok*®**

COUPLING LINKS

● Assemble or rebuild your own Herc-Alloy sling chains with all components furnished by your local distributor. Hammerlok is simple, safe, reusable. New Herc-Alloy assemblies can now be ordered with welded or Hammerlok Coupling Links as desired.

RUGGED · DURABLE **CM**® **CHAIN**

CALL YOUR CM CHAIN DISTRIBUTOR

COLUMBUS McKINNON
CHAIN DIVISION
COLUMBUS McKINNON CORPORATION
Tonawanda, New York
NEW YORK (Mountainside, N. J.)
CHICAGO • CLEVELAND • SAN FRANCISCO
In Canada: COLUMBUS McKINNON LIMITED, ST. CATHARINES, ONT.

HERC-ALLOY®

Circle 625 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

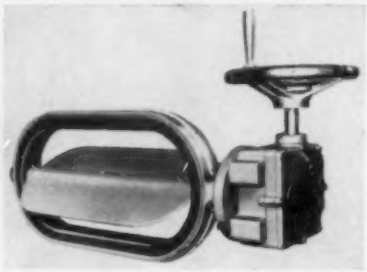
(Begins on page 180)

booths are available in a variety of sizes, with optional explosion-proof motors, motor starters, float valves. Bulletin 67 gives information. Despatch Oven Co.

For details, circle 38 on Post Card

BUTTERFLY VALVES for ventilating, air conditioning

Obround Series K Valves are control and shutoff butterfly valves for rectangular and flat oval ducts for industrial and process ventilation and air conditioning. The valve has a one-piece aluminum alloy body of small face-to-face dimension so that it is light and compact; it is adaptable with

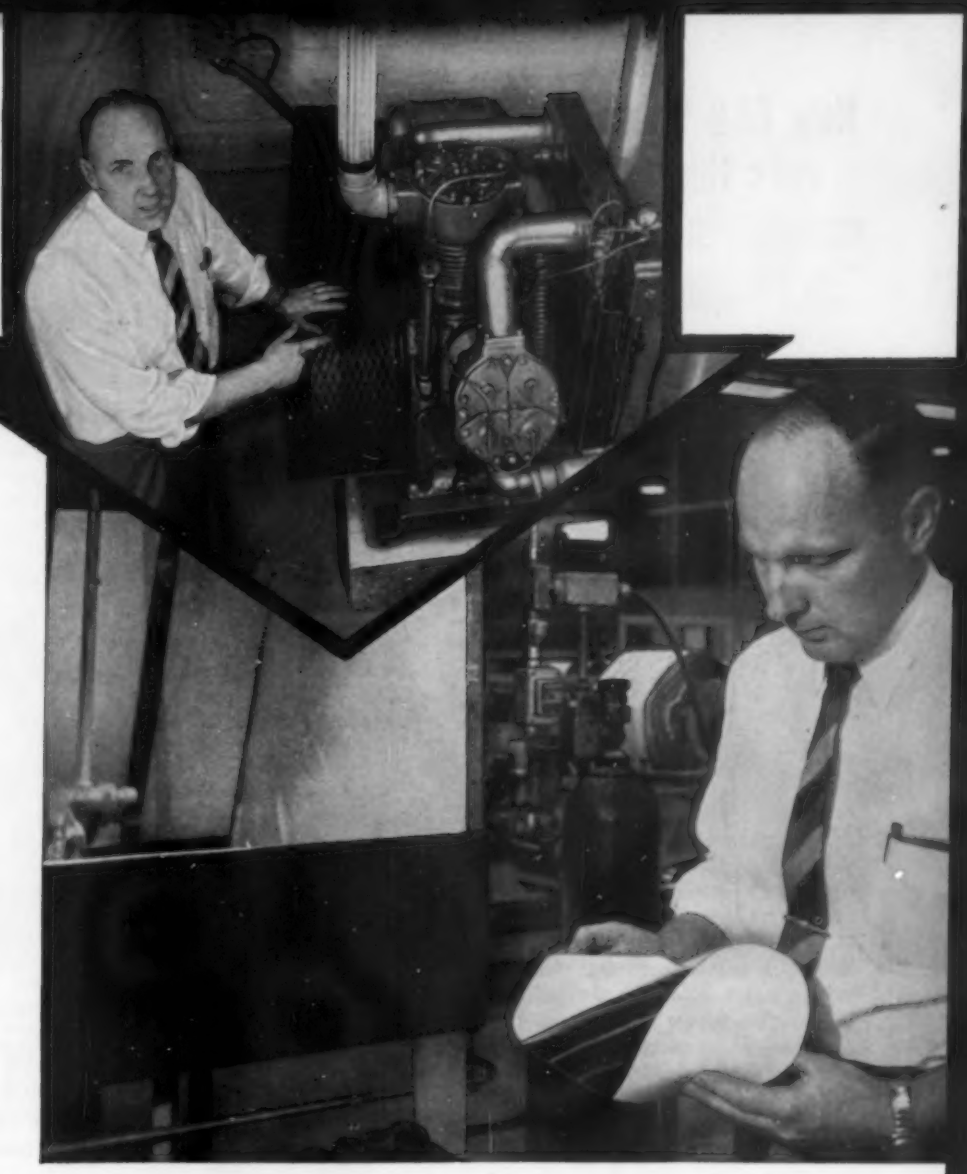


simple transitional fittings. The body has a Keelok replaceable rubber or synthetic resilient elastomer liner, against which the oval aluminum disc seats. Throttling and shutoff can be controlled by lever, handwheel (as shown) or automatically by pneumatic cylinder, diaphragm operator or electric motor. A dial indicates disc position. For automatic control, a valve positioner may be included. Fourteen sizes range from 3-by-7 to 20-by-30 in. W. S. Rockwell Co.

For details, circle 39 on Post Card

RUST PREVENTIVE gives more protection, coverage

Magnafilm 120 is announced as a rust preventive that covers two to four times the area of many products, yet provides years of indoor shelf-storage protection of metal stock, machine parts and assemblies. It is composed of film-forming materials, and rust inhibitors dissolved in safety solvent with water-displacing and fingerprint neutralizing compounds. After application by brushing, spraying or dipping, the solvent evaporates, leaving a thin, semi-solid, transparent, polar film. This film also removes soluble oil emulsion remaining after a grinding oper-



LE ROI 50S2 was installed because Bowes couldn't afford compressor downtime, says Mr. LaFara. Air-cooled unit can be used indoors or outdoors — needs no plumbing.

FINISHED TIRE REPAIR SECTION is inspected. Compressed air now permits automatic spraying of sections with liquid latex as they pass through booth at left. Production increased at least 25%.

This plant minimizes the risk of "no air - no work" with a

LE ROI 50HP STATIONARY COMPRESSOR

A dependable compressor headed the list of critical needs when Bowes Seal Fast Corp., of Indianapolis, Ind., merged two plants under one roof. A Le Roi 50S2 two-stage compressor provides this vital dependability . . . and all the compressed air needed to produce over 2000 various items for the upkeep of cars, tires, and tubes.

James S. LaFara, Plant Manager, reports that the Le Roi unit delivers 210 cfm at 125 psi . . . operates 75% to 80% of 8- to 16-hour production days, five days a week, and supplies almost 100% of all the compressed air needed. Down-time, he adds, is at a minimum, and maintenance costs are below those of two smaller compressors which the Le Roi replaced, and which now serve only as standby units.

Look what this Le Roi 50S2 does! It provides air to spray tire-repair sections (boots) and tubeless-tire repair plugs with a mixture of liquid soap and water. The unit powers latex spraying machines, and blows scraps from tube-patch cutting machines. Other uses include air for lead moulding equipment, nut-driving units, cleaning vents on chemical filling machines, and for the plant's fire-protection system.

Are you looking for a "dependable" compressor? Check the complete line of Westinghouse unit-type and Le Roi stationary air compressors — from ½ to 100 hp. Contact your Le Roi distributor, or write to Le Roi Division, Westinghouse Air Brake Co., Sidney, Ohio.

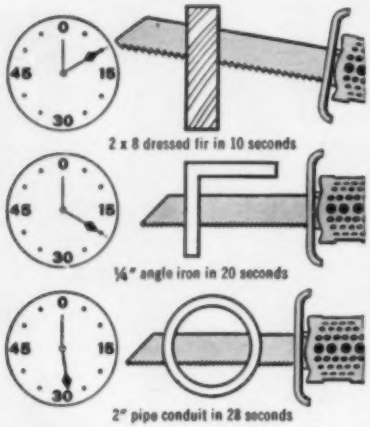
9C-09

LE ROI STATIONARY COMPRESSORS

PORTABLE AND TRACTAIR® AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS

Circle 626 on postcard, page 33

New B&D Sabre Saw cuts through all material in less time ...with spunk to spare



Wood and metal turn to butter faster ... with the new B&D power-packed Sabre Saw. Tests prove it cuts through 2x8 dressed fir, ¼-inch angle iron and 2-inch pipe conduit all in less than a minute . . . almost twice as fast as any saw its size! Greater power, new long-stroke action (cutting surface is over 1") make the difference, put more teeth into every job (assure less blade wear).

Wider range of blades, too ... for all-purpose performance

Choose from a complete new line of Sabre Saw blades—double-edged for pockets and scrolls, single-edged for any job. They fit all other leading saws, too . . . make them cut faster. Buy the new B&D Sabre Saw with five all-purpose blades at leading distributors everywhere.

Black & Decker
CUTS MAN-HOURS TO MINUTES

THE BLACK & DECKER MFG. CO.
Towson 4, Maryland
(In Canada: Brockville, Ont.)

☐ Please arrange a demonstration of B&D Sabre Saw.
☐ Please send additional information on B&D Sabre Saw.

Name.....Title.....
Company.....
Address.....
City.....Zone....State.....

Circle 627 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

ation, manufacturer points out, and it doesn't crack with expansion and contraction of the protected metal. Magnus Chemical Co., Inc.

For details, circle 40 on Post Card

ACOUSTIC CALIBRATOR for noise level meters

Type 1417 Acoustic Calibrator operates on solely mechanical means, requiring no source of power. It is produced by Dawe Instruments, Ltd. (London) for American standards and suggested for periodic calibration of sound level meters. By a system of falling balls, this calibrator produces a noise which covers a broad band of frequencies centered on 1500 cps. A noise repeatable within ± 1 db (minimum change in sound level detected by the human ear) is produced by the uniformity of the falling balls.

The unit is a cast aluminum housing with upper and lower compartments mounted in a yoke. When inverted,

small balls, in the upper compartment, fall through a narrow aperature onto a diaphragm, resulting in the calibrating noise, then continue down into the lower compartment. By inverting the housing, like an hourglass, the balls are returned to position in the upper compartment. Compact in size, the unit is 4¼ in. high, weighs 1½ lb. The Korfund Co., Inc.

For details, circle 41 on Post Card

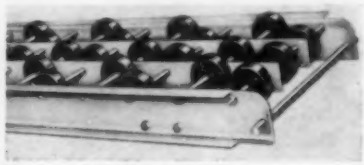
MICROFILM READER for brightly lighted drafting rooms

Model 4305 Filmcard Reader is designed to project a sharp, brilliant image of uniform intensity on a 10½ by 12 in. glare-free screen of plastic crystals. It has 14 X magnifying power. A table model, it features a single control for moving the film image in all directions and a scanning device for rapid viewing of selected areas. Film is protected by a glass film gate carrier. The reader is 23½ in. high, 19 in. deep; it operates on 115-v, 60-cycle, ½-amp a-c current. Eugene Dietzgen Co.

For details, circle 42 on Post Card

NYLON WHEEL CONVEYORS speed materials handling

These rugged conveyors have nylon wheels mounted on aluminum or steel frames and are light enough to be picked up easily and moved anywhere needed. Hook and bar couplings permit installation into existing conveyor



lines, or they can be interchanged with company's standard wheel or roller conveyors. Three types of wheels can be had: nylon with nylon bearings for lightest weight, freedom from corrosion, and least noise; nylon with double row steel ball bearings for livest action; and nylon with stainless steel bearings for similar fast response plus corrosion resistance. The conveyors come in 10-ft straight sections and 90-deg curves, in 12- to 24-in. widths. Harry J. Ferguson Co.

For details, circle 43 on Post Card

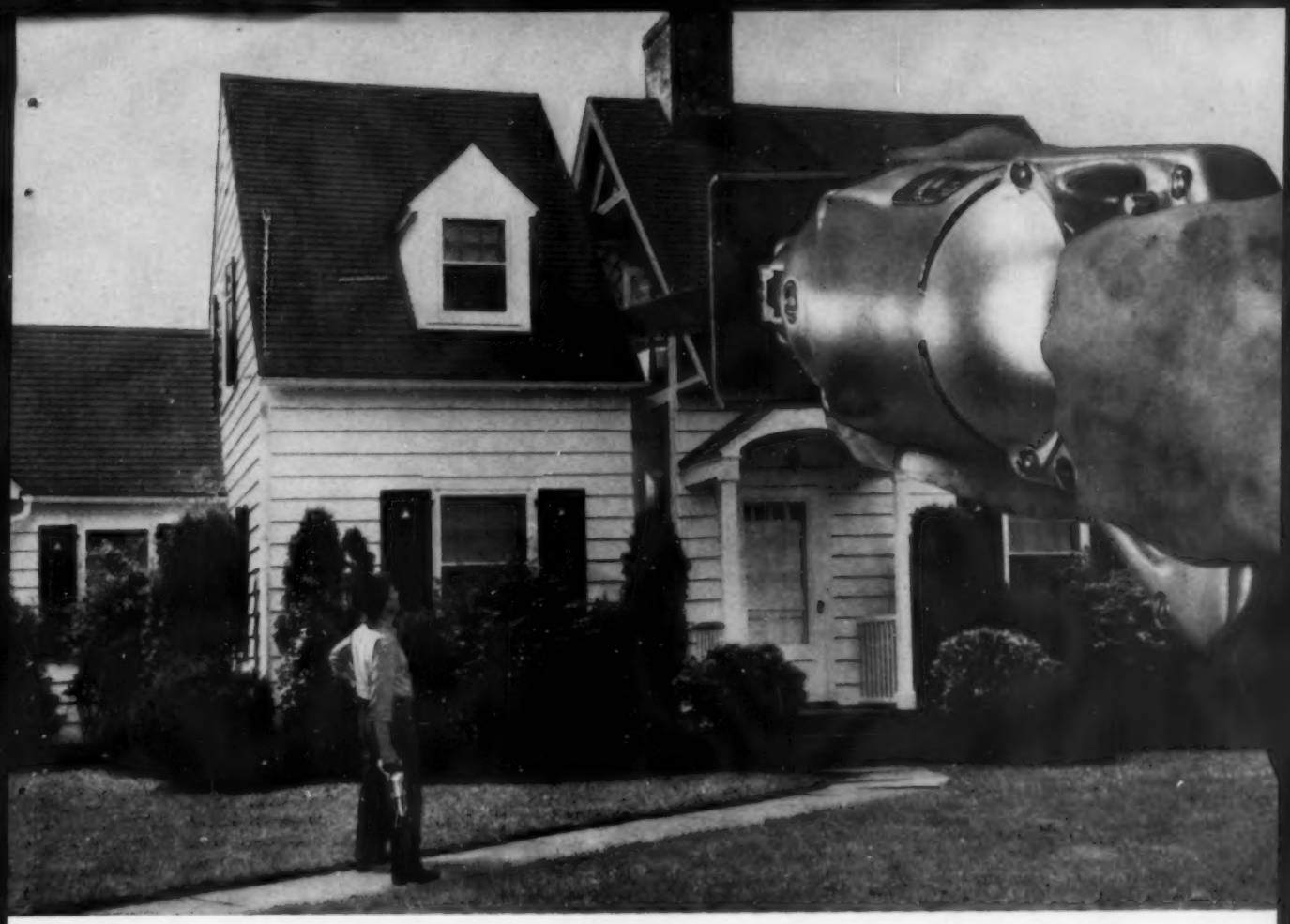
SPIRAL WOUND GASKET stands extreme heat, pressure

This new Guardian Gasket operates at temperatures from 1250 to 1900 F. It uses a ceramic paper filler which is non-flammable, inorganic and an effective chemical insulator. Field tests are reported to indicate wide application for the spring loaded thin (to 0.060 in. thick) spiral-wound gasket. Garlock Inc.

For details, circle 44 on Post Card

FAN-TYPE MIXER for small heating applications

Star-Sixties Minimixer produces an air/gas mixture and delivers it under pressure to a burner or series of burners for small industrial heating applications or installations where a blast pilot is desired and no other source of air pressure is available. Less than 6½ in. diam, the miniature fan-type mixer is designed for firing installations requiring inputs up to 215,000 Btu/hr. Inlet gas pressure of 4 in. w.c. is adequate to



The saw that could cut a house in half!

New B&D Sabre Saw with longer cut goes through wood, metal, plaster

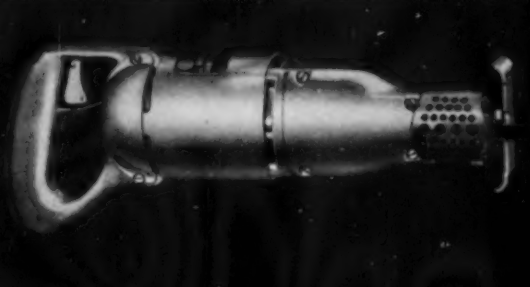
It stops at nothing! The new Black & Decker Sabre Saw power-cuts clean through wood and plaster, metal pipe and sheet . . . all as easy as you please with exclusive long-stroke action. Unique rock 'n' lock shoe design makes your work easier yet. Blade spindle turns 90° and 180° to cut in any corner, cut out any pocket. You grip right behind the safeguard blade guide for up-front control. You'll find the Sabre Saw's vibration is the lowest ever . . . its balance perfect for the most accurate cutting. Just try the new B&D Sabre Saw one time . . . and you'll see how it *could* cut a building in two, any time.

For sales and service, look in the Yellow Pages of the telephone book under TOOLS ELECTRIC

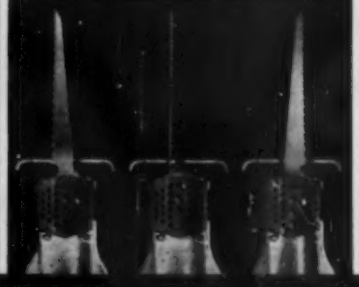
Black & Decker®

CUTS MAN-HOURS TO MINUTES

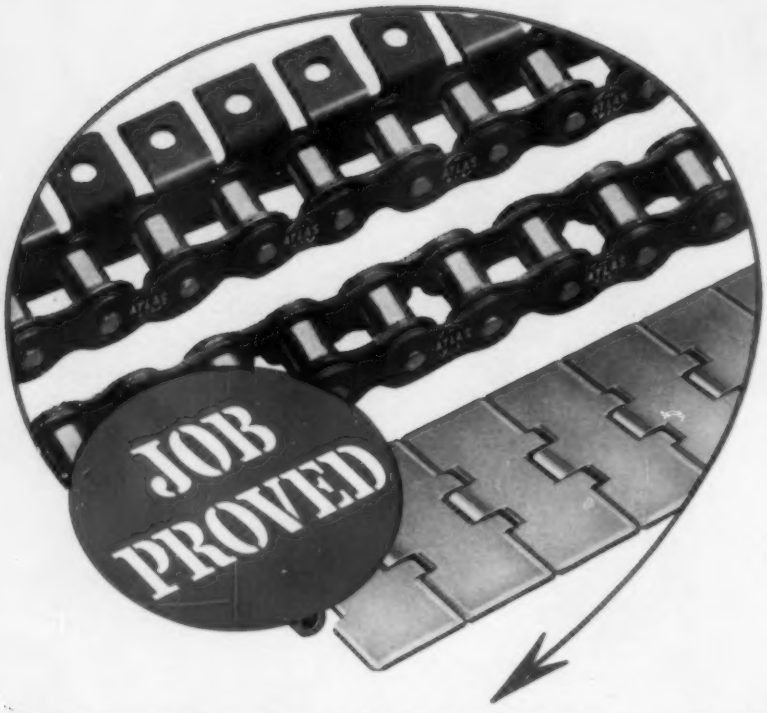
Safeguard blade guide allows grip close to cut for up-front control. *Offset-design* permits easy 90° cuts into corners and flush cuts to any surface.



Adjustable blade spindle for right, left, backward or forward cuts.



Long-stroke action provides a cleaner cut, faster work and longer blade life.

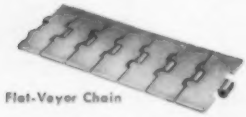


FOR EVERY INDUSTRIAL JOB

ATLAS CHAIN

A.S.A. Roller Chain

Attachment Chain


Flat-Veyor Chain

Extended Pitch Chain

PROVED AND APPROVED ON ALL TYPES OF TRANSMISSION AND CONVEYOR INSTALLATIONS

When you specify Atlas Chain you are certain of maximum performance. Every type of Atlas Chain has been "Job Proved" throughout industry for peak operating efficiency. Every length pre-tested in modern laboratories for unsurpassed quality.

From tiny timers to rugged drives... from fractional horsepower motors to mighty giants... for conveying paper boxes or corrosive liquid containers ... there's an Atlas Chain to fit your most exacting specifications. Singles or multiples... regular or heavy duty... standard or extended pitch... steel, stainless steel, bronze or Electrolized... or Flat-Veyor conveyor chain Atlas makes them in all sizes to meet or exceed A.S.A. requirements.

On present machines or planned drives specify Atlas "Job Proved" Chain for lower operating costs, less servicing and more production. For complete details and catalog contact your nearest Atlas distributor, or write direct to...

ATLAS CHAIN & MANUFACTURING COMPANY
Subsidiary Prudential Industries, Inc.
WEST PITTSTON, PA.

ATLAS
PRUDENTIAL INDUSTRIES
APCO ATLAS MRC

ATLAS

Circle 628 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

give full rated capacity. Firing can be at fixed rate, or automatic on-off control. Eclipse Fuel Engineering Co.

For details, circle 45 on Post Card

HUMIDITY RECORDER is portable or wall mounted

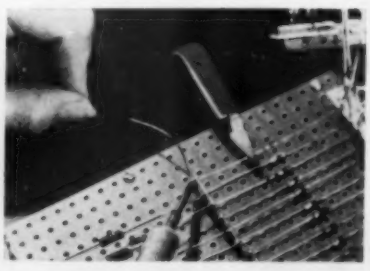
Identified as the 100J Series, this relative humidity recorder comes in four models, providing for hand portability or wall mounting, and for recording of the dry-bulb temperature on the

same chart with relative humidity. Nylon actuating elements are mounted so that exceptional accuracy is provided and rezeroing of the instrument is seldom necessary. Standard chart drives and pen-arm movements are used. Weighing 25 lb, unit provides a 12-in. chart record over a 24-hr period. Taylor Instrument Companies.

For details, circle 46 on Post Card

ASSEMBLY TOOL protects parts during soldering

For protecting delicate electronic parts, the 51E Heat Sink clips onto any small wire and dissipates heat while soldering. Largest of three available models, the one shown is 2½ in. long, has copper jaws. Two smaller models are made from Beryco 10. This tool is designed on the reverse tension prin-



Circle 629 on postcard, page 33 →

"We'd be 'in the soup' without these Ilg fans"

...John Sexton & Co., Indianapolis, Ind.

"These general-exhaust, 36" Ilg propeller fans play quite a part in our production," says Charles E. Keenan, Maintenance Foreman, John Sexton & Co., Indianapolis, Indiana.

"Our problem was that with a room full of soup-cooking kettles, humidity got so high that condensate formed on the ceiling.

"So we installed three Ilg fans and solved the problem. Humidity, both from the kettles and from water flowing across our tile floors, is now kept well under control. Helps the men; helps our production, too.

"Glad your salesman gave us such a good recommendation."

ILG

ILG ELECTRIC VENTILATING CO.

2832 N. Pulaski Road, Chicago 41, Ill.

Offices in 60 Principal Cities

Member of Air Moving and Conditioning Association, Inc. (AMCA)

Here's why ILG propeller fans and propeller fan roof ventilators satisfy

Upblast Ventilators from Ilg installed above hoods over soup kettles at John Sexton & Co., provide high-speed, vertical exhaust. Airfoil-design propeller blades (in five sizes from 24" to 48") are direct-connected to Ilg-built totally enclosed motors. Five sizes to choose from for capacities from 5060 to 33,000 cfm.
WRITE FOR CATALOG DB3-300.

Put a Pilsner on any Ilg propeller fan (as on this 42" model), flip the switch so the fan runs at full speed, and you won't find any bubbles in the beer due to vibration. Careful dynamic balancing of all component parts, and electronic checks of motor and wheels guarantee that smooth, silent operation is as much a part of every Ilg propeller fan as the "One-Name-Plate" pledge of performance. At Ilg that means every fan will last indefinitely *—without expensive maintenance.*

Follow the Flame and see why Ilg direct-connected propeller fans always run "cool." Note how the vent pipe sucks in outside air to *pressure-cool* permanently lubricated Ilg-built motors, both the single-phase permanent-split capacitor and 3-phase types. At Ilg you get cost operating advantages of *open-type* motors plus the protection of *totally enclosed* types. No motor lasts longer!
WRITE FOR CATALOG DB1-100.

ILG ELECTRIC VENTILATING CO.
2832 N. Pulaski Road, Chicago 41, Ill.
Offices in 60 Principal Cities
Member of Air Moving and Conditioning Association, Inc. (AMCA)

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

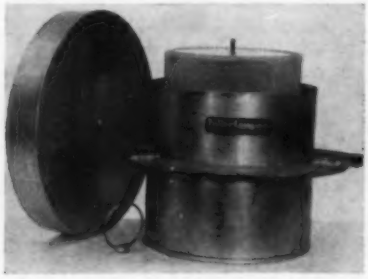
ciple—you press on the handle to open the jaws. Once clipped onto the part, the tool's own spring tension keeps it in place. Hunter Tools.

For details, circle 47 on Post Card

More information on any of this equipment can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 33-34.

PORTABLE AIR FILTERS keep bulk materials clean

These portable air filters have direct application to a variety of vacuum-type pneumatic unloading systems and are reported to keep material handled "kitchen clean". One is an intake filter for air taken into the conveying system itself; the other, a batch filter, filters air drawn into the bulk carrier during unloading. Although designed for unloading of cars involved with bulk transport of polyethylene and polystyrene pellets, the filters are suggested for other vacuum unloading systems where sanitation or prevention of prod-



uct contamination is important. The conveying air intake filter attaches directly to the car unloading nozzle by a slip coupling, while the car vent filter (illustrated) is placed directly on the open car hatch. Both units are of stainless steel and aluminum, have washable cartridge. Fuller Co.

For details, circle 48 on Post Card

TRANSPARENT TAPES come in variety of colors

Transparent, self-sticking tapes in 20 solid colors and 10 patterns are available in standard widths from 1/32 in. to 1 in. Tapes are designed for use in preparation of artwork, slides, trans-

Something New In Cranes ...at no extra cost!

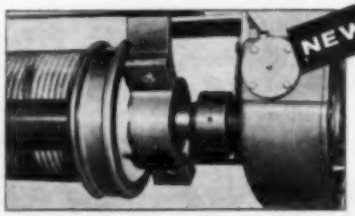
New standards of quality and modern low headroom design are established in these Series "D" Cranes. They are built for regular industrial service — *yet have many of the advantages priced into the most expensive cranes.*

NEW **TROLLEY FRAME**

All steel, welded into a single unit and integrated with the hoisting machinery. Far stronger than the mounted monorail type of unit. Compact design provides high hook lift and close end approaches. Load and motor brakes positive acting; no back drift of hook. Trolleys available for a variety of speeds, lifts, and all standard currents.

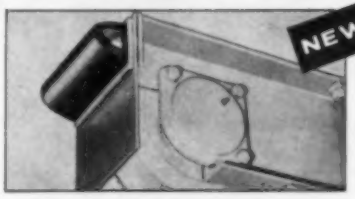
NEW **ROLLED STEEL DRUM**

A strong weldment — not a casting. Right and left hand deep-machined cable grooves provide true vertical lift at all times. No overlapping of cable on the winding drum. The drum and load sheaves have diameters at least 24 times the hoist rope diameter. Long cable life assured.



NEW **FLAME HARDENED WHEELS**

. . . on trolley *and* bridge are made of forged steel. All wheels are double flanged, with treads and flanges flame hardened to 550-600 Brinnel — nearly as hard as tool steel. Accurately machined to close tolerances, tapered bridge wheel treads assure easiest bridge movement. You can count on long wheel life.



NEW **RUBBER BUMPERS**

. . . tough, resilient. Take jolting impacts far better than wood — absorb shocks and take the strain off end trucks and bridge members. Other standard bridge features include rigid box section construction, heavy duty brake, motor and drive unit, and a checkered steel non-skid platform.

There's still more These Shaw-Box Series "D" Cranes are built in capacities from 3 to 25 tons. Models for floor and/or cab control. Spans to 80 feet. Pre-engineered components save you money and speed delivery. Write for catalog.

MANNING MAXWELL & MOORE INC. MM&M TRADE MARK

SHAW-BOX CRANES

A product of

MANNING, MAXWELL & MOORE, INC.

Shaw-Box Crane & Hoist Division • Muskegon, Michigan

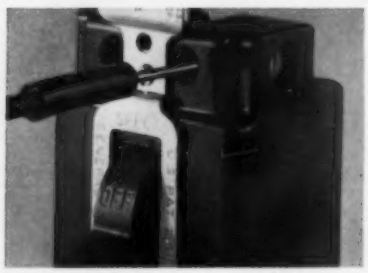
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

Circle 630 on postcard, page 33

Built to take it! G-E 30A Switch

You can trust this General Electric heavy-duty switch to do tough, full-load switching jobs, year after year. You get large, silver-plated, double-wipe contacts and a sturdy, lubricated mechanism — in a strong, well-insulated housing with a rigid, plated strap. 30A, 250V; 30T, 125V; 1½ hp @ 250V AC; 1 hp @ 125V AC. Specification Grade. Single-pole, double-pole, 3-way — in ivory or brown. Shown here: GE5196-1 (single-pole, brown.)

Heavy, clamp-type terminals grip wires like a vise, for safe, enclosed connections. Long, plated, plaster-cleaning mounting screws – held captive in strap – simplify your installation.



Handy test-prod holes save pulling switch out to test circuits. Ask your G-E distributor to show you this rugged switch. General Electric Company, Wiring Device Department, Providence 7, R. I.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Circle 631 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

parencies, etc. When overlayed on maps, drawings, layouts and graphs, they serve to introduce sections of dramatic color without obscuring pertinent detail. ACS Tapes, Inc.

For details, circle 49 on Post Card

HAND MAGNET handles small or large metal parts

This hand magnet is designed for small parts packing, sorting and weighing operations, as well as for feeding sheets into presses, shears etc. It will pick up and hold a quantity of loose nuts, bolts, screws or other light

metal objects. A squeeze on the plunger-like handle releases the parts. It separates metal sheets and is adjustable to various weights and thicknesses. Two models are available—one handles up to 3 lb of loose parts, or larger pieces to 30 lb; and a heavy-duty unit with 5- and 50-lb capacities. Magnetic Products Div., Jess Corp.

For details, circle 50 on Post Card

PORTABLE AIR COMPRESSOR is single-stage, screw type

Rota-Screw Compressors are so designed that air entering the intake port is drawn into the space between lobes of two helical rotors. These force the air into succeedingly smaller interlobal spaces, compressing it in a

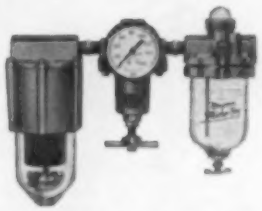
Norgren Lubro-Control Units

*A complete line of **visible oil feed** lubricator units for air-tools, air cylinders and other air-powered equipment*

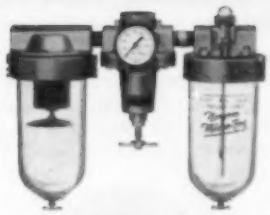
NORGREN Micro-Fog Combination Units

Easily adjustable for the exact amount of lubrication required

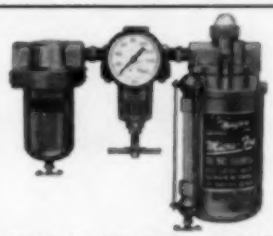
Transparent bowl filter; pressure regulator with gauge; transparent bowl Micro-Fog Lubricator. ⅛" pipe size. ½ oz. lubricator capacity. Small, compact unit for use where space is tight.



Transparent bowl automatic-drain filter; regulator with gauge; transparent bowl, Micro-Fog Lubricator. ¼", ⅜", ½", ¾", 1" pipe sizes. ½ pt. lubricator capacity.



Transparent bowl manual-drain filter; pressure regulator with gauge; transparent bowl, Micro-Fog Lubricator. ¼", ⅜", ½", ¾", 1", pipe sizes. 2½ pts. lubricator capacity.

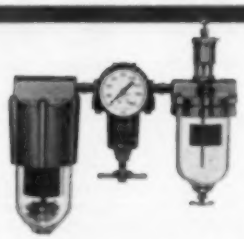


Replaceable metal bowl manual-drain filter; pressure regulator with gauge; replaceable metal bowl, Micro-Fog Lubricator with constant oil level. ¼", ⅜", ½", ¾", 1" pipe sizes. 1 qt. lubricator capacity.

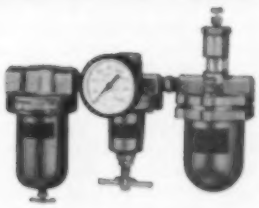
Compact cabinet unit for air operated machine tool applications. Provides filtered air, accurate regulation and control of oil delivery, visible, adjustable oil feed. ½" pipe size. 10 oz. oil capacity.

NORGREN Oil-Fog Combination Units

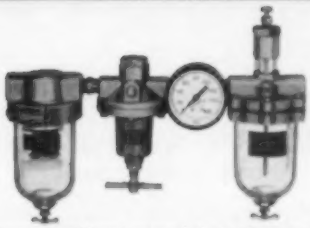
Efficient, effective lubrication of air-powered equipment.



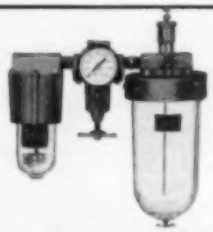
Transparent bowl automatic-drain filter; regulator with gauge; transparent bowl lubricator. ¼", ⅜", ½", ¾", 1" pipe sizes. ½ pt. lubricator capacity.



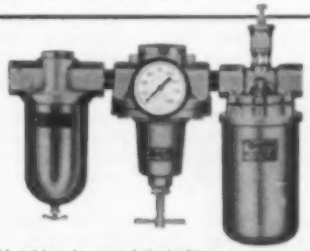
Replaceable metal bowl manual-drain filter; pressure regulator with gauge; replaceable metal bowl lubricator. ¼", ⅜", ½", ¾", 1" pipe sizes. ½ pt. lubricator capacity.



Transparent bowl manual-drain filter; pressure regulator with gauge on tee; transparent bowl lubricator. ¼", ⅜", ½", ¾", 1" pipe sizes. ½ pt. lubricator capacity.



Transparent bowl automatic-drain filter; pressure regulator with gauge; transparent bowl lubricator. ¼", ⅜", ½", ¾", 1" pipe sizes. 1½ qt. lubricator capacity.



Metal bowl manual-drain filter; pressure regulator with gauge; replaceable, metal bowl lubricator. ¾", 1" pipe sizes. 1 qt. lubricator capacity.

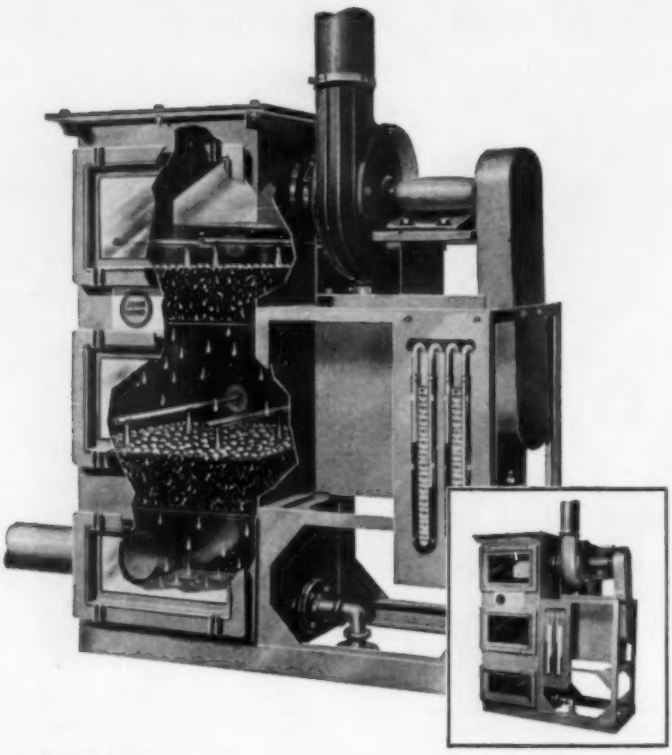
Shown here are a few models from Norgren's complete line of air filters, pressure regulators and lubricator units. For full information, call your nearby Norgren representative listed in your phone directory, or write for descriptive literature.

C. A. NORGREN CO.

SOUTH ELATI STREET • ENGLEWOOD, COLORADO

Circle 632 on postcard, page 33

New Ideas On Dust And Fume Control



New Products:

John Wood Interphase Flooded-Bed Scrubber

This unique approach to the removal of fumes, vapors and dust from ventilation systems offers a new high in operating efficiency. In fact, efficiencies in adsorption and absorption of NO_2 exceeding 95% and of HCl of virtually 100% have been obtained.

Two horizontal beds operating under flooded conditions break the air stream into bubbles 1/16 inch in diameter. Completely surrounded by the scrubbing liquid and subject to impaction forces caused by continuous change of direction, the bubbles break up. Rapid absorption is the result.

The John Wood Flooded-Bed Scrubber is a compact, integrated unit. Construction is corrosion proof and provides easy access for servicing.

New Engineering: The complete line of John Wood equipment also includes Venturi Scrubbers, Multi Cyclones, Involute Cyclones, Fabric Filters and combination units. Extensive John Wood laboratories are available for advanced research on your air pollution problems.

New Service: John Wood Air Pollution Control is fully programmed from analysis of existing conditions to equipment installation. Frequently economies result that make the installation self-liquidating through lower maintenance and replacement costs.

Write for engineering assistance or specific product information. An air pollution preliminary analysis kit is available without obligation.

AIR POLLUTION CONTROL DIVISION
JOHN WOOD COMPANY
2 NICOLET AVENUE FLORHAM PARK, N. J. TUcker 7-3200

Circle 633 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

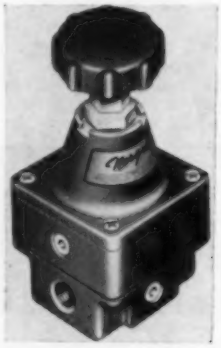
single stage until full compression is reached. As air is expelled, the next groove comes into line with the outlet port to assure free-flowing air without pulsation. Designed to operate at —40 to 115 F, the Rota-Screw has no metal contact in the compression chamber.

Operating pressure is 100 psi at 1800 rpm. Of three initial models, the 900-cfm and 600-cfm are powered by six-cylinder diesel engines; a 125-cfm size, by a six-cylinder gasoline engine. More information is given in Bulletin SP-1. Gardner-Denver Co.

For details, circle 51 on Post Card

AIR PRESSURE REGULATOR features extreme accuracy

Type 20AS Precision Pressure Regulator is announced as accurate even at pressures below 1 psig. It reduces line pressures of 0 to 150 psig to secondary pressures of 0 to 60 psig and is used



over a temperature range of 32 to 160 F. It is made for ¼-in. pipe, providing accurate pressure control up to maximum air flow recommended for such pipe. The regulator is said to operate quietly, to feature exact repeatability and freedom from drift. It has built-in relief. C. A. Norgren Co.

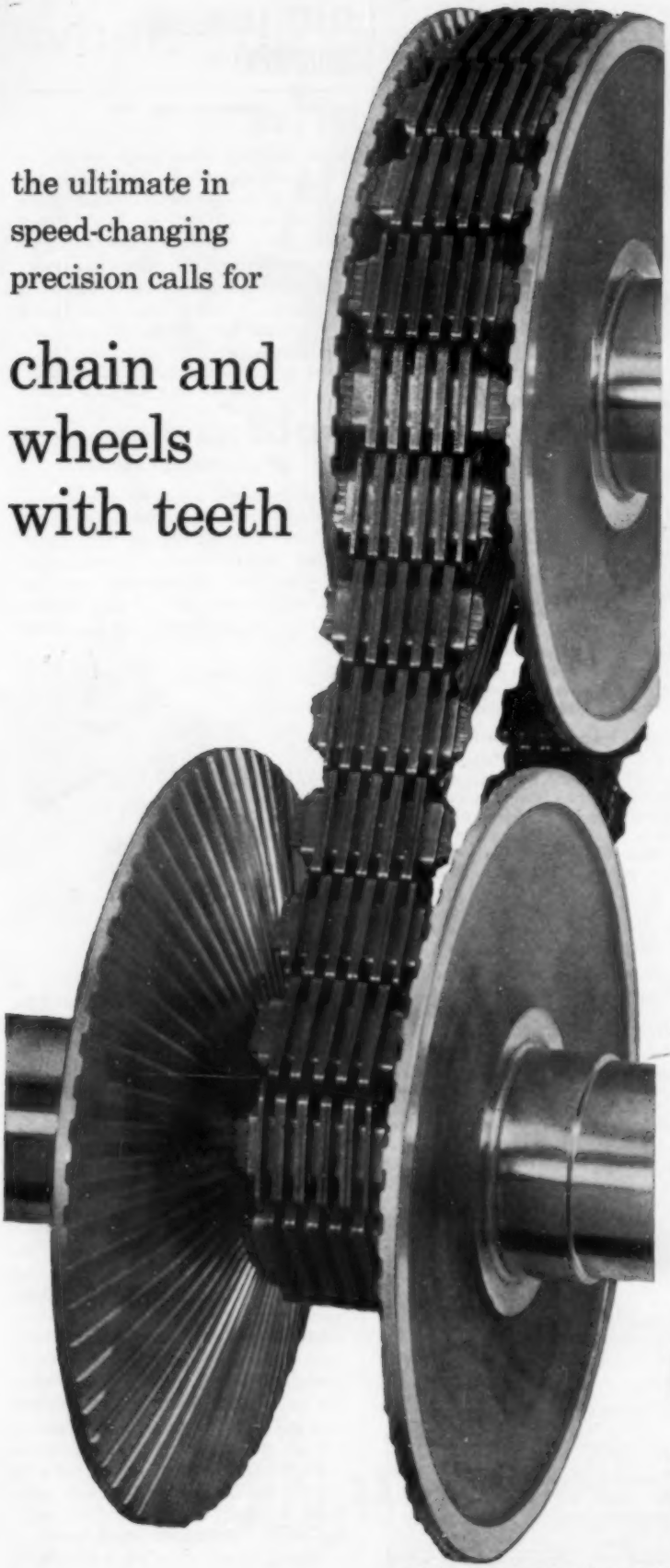
For details, circle 52 on Post Card

LARGER READOUT LAMPS display letters, numbers

Style RA 4000 Rayescent Readout Lamps have outside dimensions of 3 5/16 by 4¼ in. When mounted with other lamps, each uses only 3⅜ in. of panel width. They produce a high visibility green light, can be read at distances up to 150 feet. Letters are formed by energizing specific segments, and since all segments are on the same plane, the letters and numbers formed are readable even at wide

the ultimate in speed-changing precision calls for

chain and wheels with teeth



LINK-BELT P.I.V.

Positive, Infinitely Variable accuracy with industry's only chain-driven speed changer

Variable from maximum to minimum speeds—with no steps or stops in between—Link-Belt P.I.V. is the answer to speed-changing applications that won't tolerate slippage.

Unusual speed control accuracy results from P.I.V.'s unique design featuring *wheels and chain with teeth*. The two pairs of conical wheels act as gears . . . mesh with self-tooth-forming chain to assure positive contact under all speed and load conditions.

A turn of the control screw changes the speed. The control screw simultaneously varies the effective diameters of the conically shaped wheels—closing one pair, spreading the other. This automatically, *instantly* adjusts the chain to provide a different output speed.

Contact your Link-Belt office or authorized distributor for more information about P.I.V. drives, ½ to 25 hp. Send for catalog.

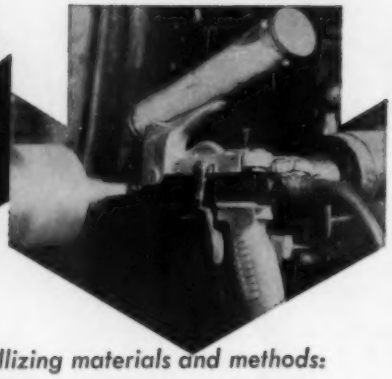
LINK-BELT

VARIABLE-SPEED DRIVES

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs; Switzerland, Geneva. Representatives Throughout the World. 10.050

Circle 634 on postcard, page 33

DO YOU KNOW WHAT METALLIZING CAN DO FOR YOU TODAY?



With today's improved metallizing materials and methods:

***Plant executives* find new ways to slash maintenance costs, reduce downtime, cut machine parts inventory...**

These real-life examples show how plants save money with metallizing:

Necks of winding rolls in a textile mill were formerly repaired by a slow machining method, requiring highly skilled labor. Now the worn necks are built up with flame sprayed metal, quickly machined to size. Savings run $20,000 a year.

Valve plugs and seats, working in sand, oil and salt water, lasted only a few hours in service. Hard-faced by welding, a set cost $155, lasted from 3 to 8 hours. When flame sprayed with tungsten carbide powder, service life was increased to a minimum of *2 weeks,* 4100% longer! Cost of metallized set, $73. But reduced downtime far outweighs the dollar savings.

A Connecticut company was sending its worn shafts out for repair by welding at a cost of $50 each. Then they found a local shop that specialized in metallizing was able to do a better job for $27.50. The same job shop salvaged a big degreasing tank, value $2,850, by flame spraying with zinc for $683. The shop made money, the customer saved money.

A shipbuilding company installed metallizing equipment to repair such parts as pump rods, pistons, crank shafts for diesel engines, stern bushings, valve stems. A badly worn tugboat shaft, replacement cost $3,000, was repaired and made better than new for $400. That job alone more than paid for the METCO equipment.

From these cases you can see how modern metallizing pays, whether in plant maintenance departments or in job shops serving the many companies that don't need their own installation. Wherever there's wear, in rotary or sliding action, there's an opportunity to save money and make money.

New and improved materials

Among these new materials are a number of nickel, chrome, boron hard facing powders. Sprayed tungsten carbides are also widely used. Many others are available to give new values to the basic benefits of metallizing, which may be summarized as: less downtime; far less machining or grinding time, reduced parts inventory; and "better than new" performance of the metallized parts.

With savings like these there are big opportunities for more efficient maintenance operations, either with METCO installations or through local job shops.

To explore these advantages and see how they apply to your operation, check the coupon below and send it off today.

METCO INC.
FORMERLY METALLIZING ENGINEERING CO., INC.
Flame Spray Equipment and Supplies

1195 Prospect Avenue, Westbury, L. I.
New York Telephone: Edgewood 4-1300
Cable: METCO. In Great Britain: METCO, Ltd., Chobham-near-Woking, England

METCO INC., 1195 Prospect Avenue, Westbury, L. I., New York

How to SAVE MONEY and cut downtime with Metallizing

☐ Send copy of Bulletin 15, "How to Save Money and Cut Downtime with Metallizing"
☐ Have Field Engineer Call

Name _____
Title _____
Company _____
Address _____
City _____ Zone _____ State _____

Circle 635 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

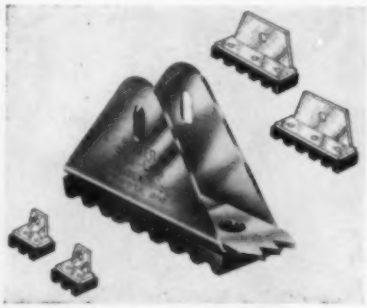
(Begins on page 180)

angle viewing. The lamps operate at 240 or 460 v, 60 or 400 cycles per second, with electrical contact made by pins molded into the back. Rated useful life is 5000 hr; however brightness decreases as the lamps are operated. Average brightness is increased as voltage is raised. Individual lamps cost around $25. Westinghouse Electric Corp.

For details, circle 53 on Post Card

STEPLADDER SHOE protects at all contact points

These stepladder shoes come in "fours" —one for each leg of the ladder. They are aluminum extrusions with heavy rubber soles riveted at three points. They are available with the back pair in a smaller size for light duty ladders, or with all in large size for front



rails and back legs of heavy ladders. For extension and single ladders, a two-way combination style can be had with both rubber sole for use in horizontal position indoors and hardened steel spur for use in vertical position on ice, hard ground, or concrete. The Bauer Mfg. Co.

For details, circle 54 on Post Card

PHOTO CONTROL for outdoor lighting applications

This quick-response control is for lighting applications where extended time delay is not desired. It functions automatically to control any lighting circuit or individual luminaires. It is built around company's cadmium-sulfide photoelectric cell, reported to have the lowest failure rate established, and this cell is combined with a simplified circuit and minimum of components. Control incorporates hermetically sealed rectifier and relay with contacts normally-closed for "fail safe" operation. Components are mounted on a printed circuit board having multiple

when you discuss pumps what does SG stand for?

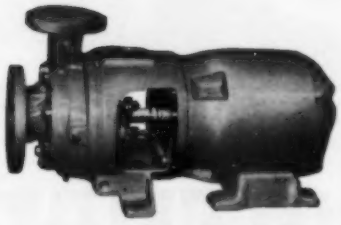
THE TECHNICAL DEFINITION

In the field of hydraulics, SG stands for SPECIFIC GRAVITY and is the ratio of the specific weight or density of a liquid with reference to fresh water with a base of 1.0 gram per cubic centimeter.

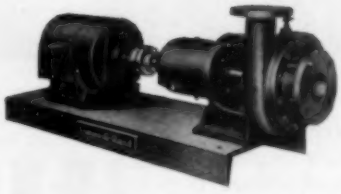
BUT THERE'S ANOTHER MEANING TOO

From a product standpoint Ingersoll-Rand also likes to think of SG as "SUPERIORITY GUARANTEED"...the extra value in design, workmanship and efficiency offered when an Ingersoll-Rand centrifugal pump is selected for your application.

If you are having a pumping problem why not look into the added values of Ingersoll-Rand centrifugal pumps. Naturally our personnel are well aware of the effect of specific gravity on pump performance. There are pump specialists in every I-R branch office. Call them or see an authorized distributor of our complete commercial line of pumps.



Close-coupled Motorpumps ¼ through 75 hp—1, 2 and 4-stage models. Capacities to 3200 gpm — heads to 650 feet. Also available in self-priming models.



Cradle-mounted pumps ½ through 100 hp — 1 and 2-stage models. Capacities to 3200 gpm—heads to 525 ft. Also available in self-priming models.

Horizontally-split pumps 1½ through 400 hp—1 and 2-stage models. Capacities to 4000 gpm—heads to 1100 ft.

Ingersoll-Rand

249A9 11 Broadway, New York 4, N.Y.

OTHER PUMPS TO 200,000 GPM—PRESSURES TO 6500 PSIG.

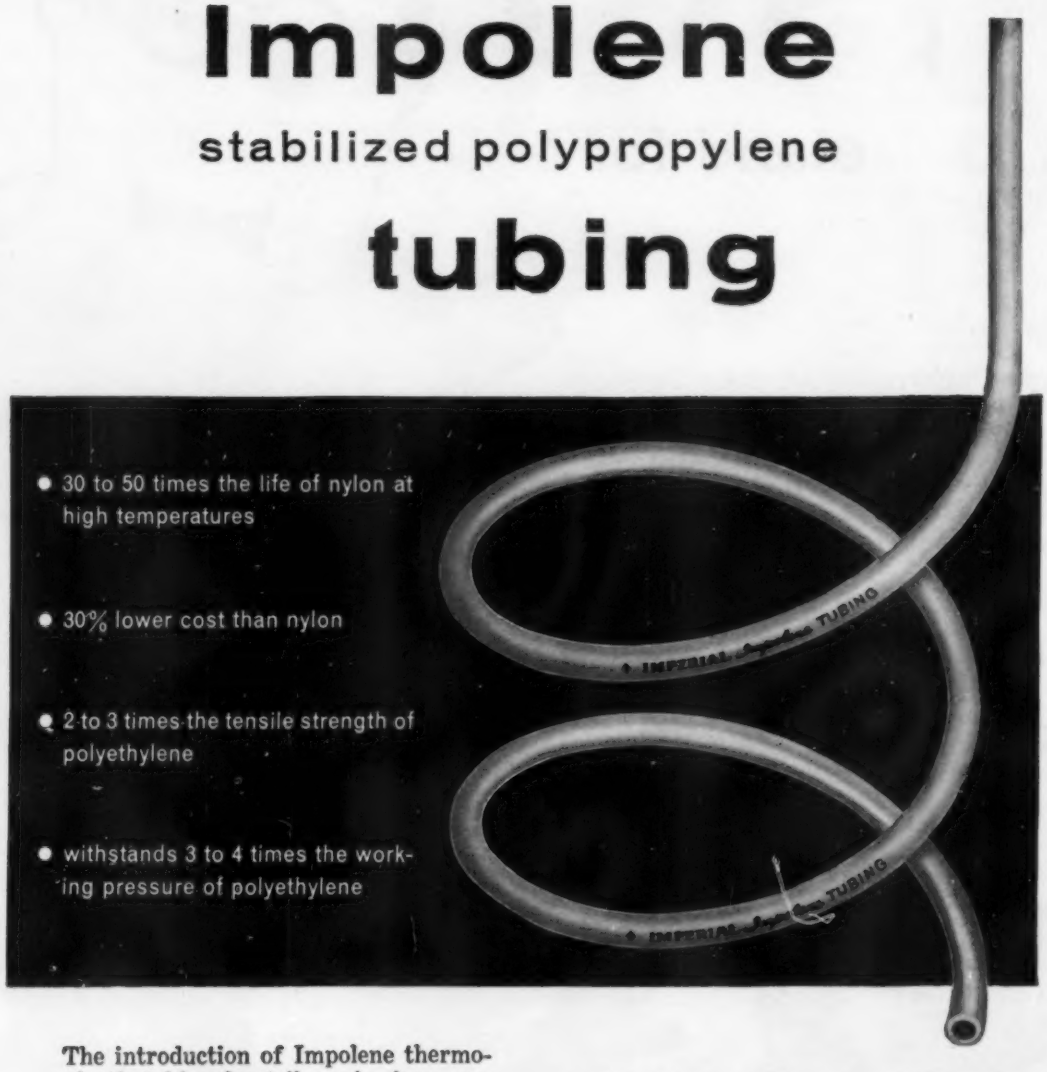
Circle 636 on postcard, page 33

new

Impolene

stabilized polypropylene

tubing


• 30 to 50 times the life of nylon at high temperatures
• 30% lower cost than nylon
• 2 to 3 times the tensile strength of polyethylene
• withstands 3 to 4 times the working pressure of polyethylene
IMPERIAL Impolene TUBING
IMPERIAL Impolene TUBING

The introduction of Impolene thermoplastic tubing foretells major improvements in the transmission of air and fluids. This Imperial-Eastman stabilized polypropylene tubing now has many proved uses. Many more await it. What's yours? For complete data, write for Impolene Bulletin No. 301.

IMPOLENE

IMPERIAL EASTMAN

Imperial-Eastman Corporation General Offices: 6300 West Howard Street, Chicago 48, Illinois

In Canada: Imperial-Eastman Corporation (Canada) Ltd., P.O. Box 645, Barrie, Ontario

Circle 637 on postcard, page 33

new

Impolene

with *new* advantages, many *new* uses

High tensile strength. Highest strength-to-weight ratio of all thermoplastic tubing. Working pressures compare favorably with nylon—are 3 to 4 times greater than polyethylene.

Excellent corrosion-resistance. Resists concentrated hydrochloric acid up to the boiling point. Withstands saline solutions at temperatures over 212° F. Shows no detrimental effects in boiling sulfuric acid.

Wide temperature range. Can be used up to 300° F. Has 30 to 50 times the life of nylon at elevated temperatures. Remains flexible at −100° F.

Good abrasion-resistance. High surface hardness gives it much better abrasion-resistance than most thermoplastics.

Odorless . . . tasteless . . . resists sunlight. Approved by the FDA and NSF for food and drinking water applications.

Use Impolene tubing for air lines, control panels, instrumentation and lubrication systems, processing and construction machinery—many other uses.

Available in 500′ to 1000′ spools in O.D. from ⅛″ to ⅜″. Other sizes available on special order.

Poly-Flo Fittings—designed for use with all plastic tubing, yet usable with soft metal tubing. Withstand pressures beyond burst strength of tubing. Available in a complete range of sizes and styles.

Now Imperial-Eastman meets all your requirements for hydraulic-pneumatic-flow system components: tube fittings, valves, couplings, flexible and rigid hydraulic and pneumatic lines, thermoplastic tubing, tubing tools.

TUBING

IMPERIAL — EASTMAN

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

air gaps to protect against surges in excess of 1400 v. Control will switch up to 1000 w incandescent load, or 1800 v-amp mercury vapor or fluorescent load. It has an operating range of 0.5 to 3.0 ft-c, can be had for 120- or 240-v operation. Publication GEA-7230 describes it. General Electric Co.

For details, circle 55 on Post Card

SCRUBBER for wet cleaning, gas absorption, cooling

The Impinjet is said to provide high efficiency (99 per cent on some dusts) scrubbing action with low operating and maintenance costs. Single-and multiple-impingement plate units are available. Scrubbing is by turbulent interaction of gas and liquid, as effected by the stainless steel impingement baffle plate. In operation, dust

or fume laden gas is drawn through the inlet under pressure. It passes up through the humidifying spray and is pulled through the perforated plate where it is divided into thousands of individual jets. The single-stage scrubber handles dust loadings at inlet of up to 100 grains per cubic foot, removing suspended materials from submicron fumes to larger dust particles. Due to simple design, pressure drop and resultant power requirements are low. Liquid consumption is 1 to 3 gal per 1000 cfm at 20-40 psig. Where extra high efficiency is desirable, additional plates can be added without increasing liquid consumption. The W. W. Sly Mfg. Co.

For details, circle 56 on Post Card

LINT-FREE TOWEL for handling electronic parts

This highly absorbent lint-free towel, made of spun viscose is claimed to do away with the lint problem in handling of industrial and electronic parts. The towel is also suited for wiping glassware, mirrors and metal. Advance Glove Mfg. Co.

For details, circle 57 on Post Card

CHAIN for use on new or exisiting express rollers

This type of endless chain caterpillar track is readily removable from the roller frame—chain strands are removed or installed in seconds by pull-

ing a slip ring. The chain can be easily cleaned and lubricated, and the frame can be degreased without immersing the complete roller. Hilman Equipment Co.

For details, circle 58 on Post Card

PACKAGED PUMPS are close-coupled, end-suction

Reduced space requirements and faster, easier installation are claimed for these pumps. Disassembly without disturbing suction or discharge piping facilitates maintenance. Vertical centerline discharge makes pumps self-venting, eliminating possibility of vapor lock and providing smooth operation with low noise level. Pumps come in sizes from ¾ to 1 to 3-by-3 in. Capacities range to 400 gpm. Aurora Pump Div., The New York Air Brake Co.

For details, circle 59 on Post Card

FHP MOTORS are totally enclosed, three-phase

Designed for use in the lint-laden atmospheres of the textile industry and suitable for many other industrial machinery applications, these fractional horsepower motors are totally enclosed,

THE ECONOMICAL APPROACH TO VIBRATION CONTROL

JACMOUNT

MACHINE MOUNTS

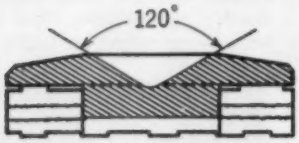
Jacmounts are designed for economy in machine mounts. While low in cost, they rate high in their ability to isolate shock and noise, and to dampen 85% or more of machine vibration.

Jacmounts are made in two units: a cast steel base plate — bonded to a heavy pad of shock absorbent Air-Loc®; and a jack screw assembly for accurate leveling. The base plate is recessed with a 1¼" diameter cone-shaped depression to accommodate the screw.

Jacmounts are easily installed, requiring no bolting or cementing.

BUY ONLY WHAT YOU NEED FOR YOUR MACHINES

Many machines already have jack screws furnished as original equipment. In this case, you buy only the base plate. Its conical recess has an included angle of 120° to take a wide range of screw diameters. If your machines are without jack screws, you buy the complete unit.



Conical recess will accommodate a wide range of screw diameters.

In either case, you'll get a mount of excellent stability and performance.

Jacmounts are adaptable to your mounting requirements. Call your local Air-Loc distributor now, or write for complete information.

Air-Loc® DIVISION

Clark, Cutler, McDermott Co.

115 WEST CENTRAL ST. • FRANKLIN, MASS.

Circle 638 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

non-ventilated, three-phase Form G units. They are rated from ¼ to ¾ hp, and 220/440, 220/380 and 550 v. The ¼-hp motors are in NEMA frame sizes 48 and 56; all others are frame size 56. The line features continuous duty operation at 55 C rise; single-shielded ball bearings; large built-in connection box that permits easy electrical connection. General Electric Co.

For details, circle 60 on Post Card

GEARLESS PORTABLE SAW is lightweight, air powered

This compact saw is easy to handle, and offers reserve power for tough cutting jobs and the inherent safety of an air-driven motor. Weighing less

than 14 lb, the saw is 14 in. long, has a standard operating speed of 6000 rpm developed from direct motor to blade drive—no gearing. Under normal working conditions its air consumption is 30 cfm. The saw can be used safely in any atmospheric conditions, manufacturer points out, and operated indefinitely at maximum cutting rate without overheating or harm to motor. The Master Power Corp.

For details, circle 61 on Post Card

Use the Reader Service Cards provided on pages 33-34 to ask for more information on any of this equipment.

FLOOR SURFACER resists impact, abrasion, corrosion

Stonclad is a dense, non-porous, self curing plastic surfacer which bonds tenaciously to the base on which it is applied. It cures quickly after application because it hardens by polymeriza-

How many of these 12 losses can you cut with Penco-Planned shelving & lockers?

☐ Product Damage	☐ Poor Inventory Control	☐ Production Bottlenecks
☐ Excessive Handling Costs	☐ Insurance Costs	☐ Shipping Bottlenecks
☐ Waste Space	☐ Pilfering	☐ Plant Cleaning Costs
☐ Slow Order-filling	☐ Accidents	☐ Low Employee Morale

If your company is considering new shelving and lockers, look into Penco Planning before you buy. Your Penco representative can show you how Penco units can be used to control *up to 12 major drains on efficiency and profitability* . . . if your operations and requirements are studied in advance. Re-check the list above! The secret is not how many units you buy, but how well units are integrated into your operations as functional systems. Check the Penco installations shown here. Then get more details in our free booklet "12 Losses Penco Planning Can Control". It's filled with slants on how to make storage facilities pay off. Finally, before you buy any lockers or shelving, call your nearby Penco dealer for advice and for fast, efficient service.

One look tells you that these Penco-Planned lockers step up employee morale, cut housekeeping costs.

New Penco T-Line boltless shelving above covers 48,000 sq. ft. . . . speeds handling of 15,000 production items. It simplifies inventory of parts in process, and permits fast changes of layout. No tools are required.

SEND FOR THIS FREE BOOKLET TODAY

ALAN WOOD STEEL COMPANY
PENCO DIVISION 430 Brower Ave., Oaks, Pennsylvania

Please send free booklet, "12 Losses Penco Planning Can Control." (No obligation, of course.)

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

Please send also: ☐ General Shelving Catalog ☐ General Locker Catalog

Circle 639 on postcard, page 33

Where Dirt Could Mean DANGER...

North American Aviation plant, Downey, Calif.

Vacuum cleaning during the final assembly provides all-important "last minute" protection.

You'll find SPENCER Vacuum Systems

Built-in vacuum systems by Spencer are being relied on increasingly by industry to protect product quality during inspection and assembly.

In this "white room" at the Autonetics plant of North American Aviation, for example, a Spencer system is utilized for:

1. Frequent floor cleaning to maintain critical standards of dust-free cleanliness.
2. Final cleaning of components—by use of bench inlets at the individual assembly stations.

Whatever your needs in a built-in system—or industrial portable vacuum cleaners—it will pay to check with SPENCER . . . world leader in industrial vacuum cleaning equipment.

Request Catalog #155B

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

Circle 640 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

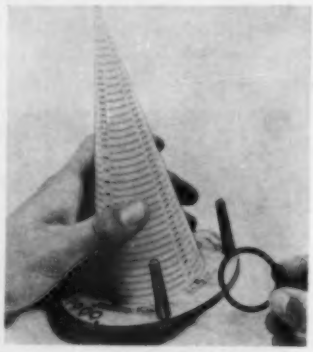
(Begins on page 180)

tion rather than hydration. Ease of application is also an advantage. You clean the old floor and apply a thin ⅛ to ¼ in., (depending on traffic) coat of Stonclad, without pre-roughing or squaring off. The material is buttered on with a trowel, may be feather-edged. Spillage of most acids, alkalies, salts, organic compounds, oils and greases is claimed to have no effect on a Stonclad surface. Stonhard Co.

For details, circle 62 on Post Card

O-RING SIZE GAUGE measures ID and cross section

This visual gauge lets you check inner diameter and cross section of O-rings without manual or mechanical measuring. It consists of a single unit cone mounted on a slotted base with an adjustable cross section measuring



strip. The inner diameter of the O-ring is measured by placing it on the cone, while the cross section is measured with slots on the base (see photo). Proper relationship of Parker Seal -2 Series or ARP (AN) sizes can be checked by reading vertical column on adjustable strip. Gauge costs around $4.00. Parker Seal Co.

For details, circle 63 on Post Card

ORAL RESUSCITATOR works without physical contact

The Venti-Breather overcomes the major objection to mouth-to-mouth rescue breathing—physical contact. It is suited for use on victims of shock, drowning and other forms of normal breathing paralysis, and simple to use. The unit consists of mouthpiece, breather tube, one-way valve and flexible mask. The rescuer breathes into the mouthpiece. His breath passes through the breather tube, closing the exhaust vents, and inflates the vic-

EXIDE POWER PACKAGE

Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

Extra economy assurance for your new walkie-type truck—the Exide guarantee of battery life equal to truck life.

BATTERY GUARANTEED FOR LIFE OF TRUCK

Let's say you're about to buy a new walkie-type electric industrial truck. You want long battery life for maximum economy, and you don't want the nuisance of ever replacing the battery, if you can avoid it. Well, this is the Exide offer:

For walkie-type low lift trucks and hand tractors, the recommended Exide nickel-iron-alkaline battery (the type invented by Thomas A. Edison) is guaranteed for the life of the truck—provided the truck remains in your possession and approved maintenance procedures are followed.

The Exide Power Package. Recommended battery and charger from the world's broadest lines—plus factory-quality service to cover both.

This is not a reckless offer. Exide knows from countless actual performance records that these batteries readily give this kind of life. Many Exide nickel-iron-alkaline batteries have been used in walkie-truck service for upwards of 20 years and are still going strong. So the plain fact is that we are simply giving you positive assurance of battery value that is already there anyway.

Long life is one of the characteristics of Exide nickel-iron-alkaline batteries. They have other unique advantages too. They are lighter in weight than other batteries. They give off no corrosive fumes during use or while charging. And they can be stored indefinitely without injury. This is of special value during seasonal shutdowns or other inactive periods. All you do is discharge the battery, short-circuit the terminals and store in a clean, dry place.

Of course, for any type electric industrial truck—walkie, rider, or narrow-aisle—the maximum power economy depends on three factors: the right battery for the job, a charger to match, and needed service. This combination is the Exide Power Package.

Your Exide representative studies your requirements, then recommends the battery best for your needs from the broad Exide line. He is completely objective in determining your needs because Exide offers all types: Exide-Ironclad with tubular positive plates, Exide-Powerclad premium flat-plate, and Exide nickel-iron-alkaline. Exide chargers are available in both motor-generator and silicon rectifier types and in sizes to cover all needs. Exide service men are coast to coast, all factory trained on batteries and chargers.

The Exide Power Package is your easiest way to get not only maximum battery life in your applications, but maximum battery economy year after year. Write for details. Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

Exide®

Circle 641 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 180)

tim's lungs. As the rescuer pauses to inhale, the one-way valve closes and the exhaust vents open. The victim's lungs deflate and his exhaled breath is vented outward to the atmosphere instead of into the rescuer's mouth or face. Mine Safety Appliances Co.

For details, circle 64 on Post Card

PLASTIC FITTINGS for power line pipe ends

Belled-end fittings that facilitate inserting power cables at the start of underground conduits of thermoplastic pipe are fabricated from stock sizes of polypropylene, polyethylene, polyvinyl chloride or other thermoplastic piping. The bell-shaped end flares to approximately twice the outside diameter of

the pipe. The other end is normal pipe size for coupling by heat sealing, or solvent cementing in the case of polyvinyl chloride, to runs of plastic pipe used to guard underground power lines against corrosion and electrolytic action. A ring, thermally welded around the body of the fittings provides an additional anchor for piping encased in concrete. Tube Turns Plastics Inc.

For details, circle 65 on Post Card

FLOOR JOINT FILLER with high load bearing ability

Flexjoint is an expansion-contraction joint filler which resists many chemicals and remains flexible over a wide useful temperature range. It is said to bond to both concrete and brick surfaces with greater strength than the materials it joins. Available in black or gray, Flexjoint is a two-component resin system formulated in both pouring and caulking grades. The former cures rapidly into a stiff, expansion-contraction joint material. The caulking grade can be used as a strongly bonded sealout, caulking material or expansion joint for metal, concrete, stone, masonry or wood. Pennsalt Chemicals Corp.

For details, circle 66 on Post Card

COMPOUND kills algae, removes odors and tastes

S-K Algam is formulated to kill algae in water and mildew and fungi on plant life or on damp surfaces, and to remove odors and tastes from reservoirs and air conditioning cooling tower spray ponds. It is intended to supplement manufacturer's S-K Algaecide for more effective treatment of algae problems. When used with the S-K Algaecide, a pound of S-K Algam treats 40,000 gal of water for 15 to 30 days. Stiles-Karlsonite Corp.

For details, circle 67 on Post Card

TREATMENT cures and seals concrete floors

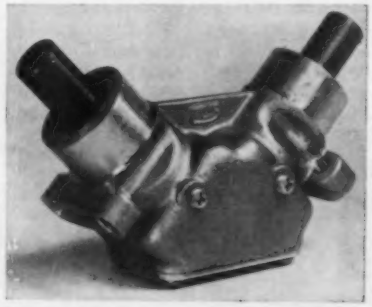
Flexcure provides a transparent coating over newly laid concrete floors which delays evaporation of water in the concrete while proper curing takes place, eliminating need of constant wetting and covering. Flexcure is also a deterrent against dusting, scaling and hair cracks. It repels oil and grease and the concrete develops high resistance to abrasion, solvents and alkalies. Paint, asphalt tile and other coverings can be applied. Flexrock Co.

For details, circle 68 on Post Card

GEAR BOX designed for making sharp bends

This completely enclosed 90-deg gear box, designed for making sharp bends in rotary-type remote control linkages, consists of a cast bronze housing and two spindles with bevel gears supported in needle bearings. Gears are splined internally and pinned for laterally holding only. Gear box comes in three sizes with torque capacities from 500 to 3500 lb, is reported about 88 per cent efficient. The relatively short spindles on the box means that unit can fit into sharp corners. Housing has tapped holes. Stow Mfg. Co.

For details, circle 69 on Post Card



G-B BLANKET INSULATION DISTRIBUTORS

AKRON, Ohio, The Asbestos Supply Co.
ALBANY, Ga., Industry Insulation Co.
ALBANY, N. Y., Hudson Valley Asbestos Corp.
ALBUQUERQUE, N. M., Mt. States Insulation Co.
AMARILLO, Tex., McDonald Engineering & Insulating Co.
Morrison Supply Co.
ANDERSON, S. C., Building Material & Equipment Co.
ATLANTA, Ga., Reynolds Aluminum Supply Co.
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AUSTIN, Tex., Cinbar Engineering Co.
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BANGOR, Me., Eastern Glass Co.
BATON ROUGE, La., Eagle Asbestos & Packing Co.
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CHAMPAIGN, Ill., The Lewie-David Co.
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CHARLESTON, W. Va., Asbestos & Insulating Co.
CHARLOTTE, N. C., D & B Insulation Co.
CHICAGO, Ill., E. C. Carlson Co.; Culberg Asb. & Cork Co.
CHRISTOPHER, Ill., Hoe Supply Co.
CINCINNATI, Ohio, R. E. Kramig Co.
CLEVELAND, Ohio, Ohio Asbestos & Insulation Co.
COLUMBUS, Ohio, Santeler Brothers
Culberg of Ohio
CORPUS CHRISTI, Tex., Precision Insulation Co.
DALLAS, Tex., Acme Insul. & Sup. Co.; Payne Ladewig, Inc.
Electrical Supply Co.
DAVENPORT, Iowa, Republic Electric Co.
DAYTONA BEACH, Fla., B & F Insulation Co.
DECATUR, Ill., The Lewie-David Co.
DENVER, Colo., Plateau Sup. Co.
DES MOINES, Iowa, Iowa Asbestos Company, Inc.
DETROIT, Mich., The Walter Rankin Co.
EL PASO, Tex., Insulation & Specialties, Inc.
M & M Refrigeration & Supply Co.
ERIE, Pa., Laco-McMullen Co.
EVANSVILLE, Ind., Geo. Koch Sons., Inc.
FALCONER, N. Y., Laco Roofing
FT. SMITH, Ark., Ball Distributing & Engineering Co.
FT. WAYNE, Ind., M. H. Hilt, Inc.
FT. WORTH, Tex., Bracken Co.
GAINESVILLE, Fla., Baker Bros., Inc.
GRAND RAPIDS, Mich., M. S. Knee Co.
GREENSBORO, N. C., Starr Davis Co., Inc.
GULFPORT, Miss., Paine Supply Co.
HONOLULU, Hawaii, Parker Fallis Insulation Co., Inc.
HOUSTON, Tex., Precision Insulation Co.
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IRON MOUNTAIN, Mich., Champion, Inc.
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KANSAS CITY, Mo., Central Sup. Co.; Kelly Asbestos Prod.
Insulation & Acoustical Specialties Co., Inc.
KEWANEE, Ill., Mechanical Insulation Co., Inc.
KINGSPORT, Tenn., Willis Supply Co.
KNOXVILLE, Tenn., Willis Supply Co.
LAKE CHARLES, La., Coburn Sup. Co., Inc.; Solar Sup. Co.
LOS ANGELES, Calif., Accurate Insulation Co., Inc.
Western Fibrous Glass Products Co.
LOUISVILLE, Ky., General Insulation & Roofing Co.
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MACON, Ga., Industry Insulation Co.
MARIETTA, Ohio, Asbestos & Insulating Co.
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Southern Metal Products Co.
MILWAUKEE, Wisc., F. R. Dongel Co.
MINNEAPOLIS, Minn., Asbestos Products, Inc.
MOBILE, Ala., Shook & Fletcher Insulation Co.
MONTGOMERY, Ala., Shook & Fletcher Supply Co.
MOORHEAD, Minn., Fargo-Moorhead Insulation Co.
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NEWARK, N. J., Eastern Steam Specialty Co.
Robert A. Keasbey Co., Inc.
NEW ORLEANS, La., Eagle Asbestos & Packing Co.
NEW YORK, N. Y., Eastern Steam Specialty Co.
Robert A. Keasbey Co., Inc.
ODESSA, Tex., Western Chemical & Supply Co.
OKLA. CITY, Okla., Ball Distributing & Engineering Co.
OMAHA, Nebr., Cardinal Supply & Mfg. Co.
ORANGE, Conn., Insulation Supply Co.
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PORT ARTHUR, Tex., Coburn Supply Co.
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RICHMOND, Va., Reynolds Aluminum Supply Co.
ROANOKE, Va., C. E. Thurston Co.
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Western Fibrous Glass Prod. Co.
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ST. LOUIS, Mo., Refrigeration Supplies, Inc.
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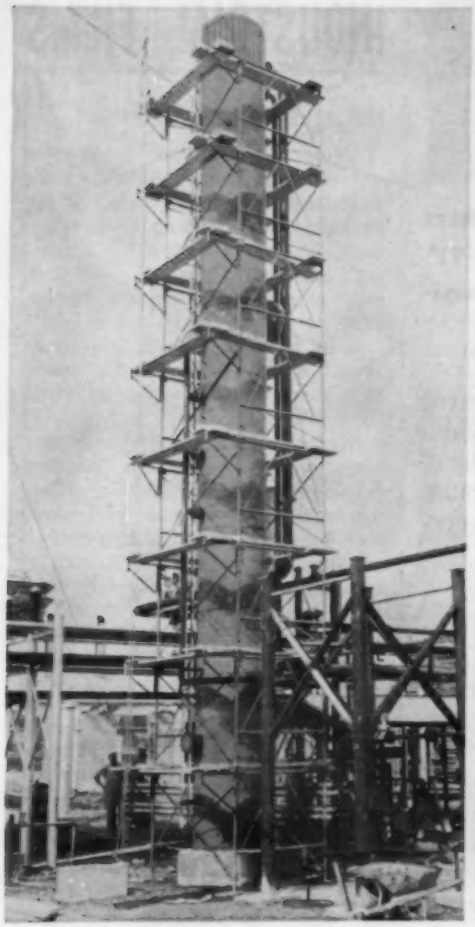
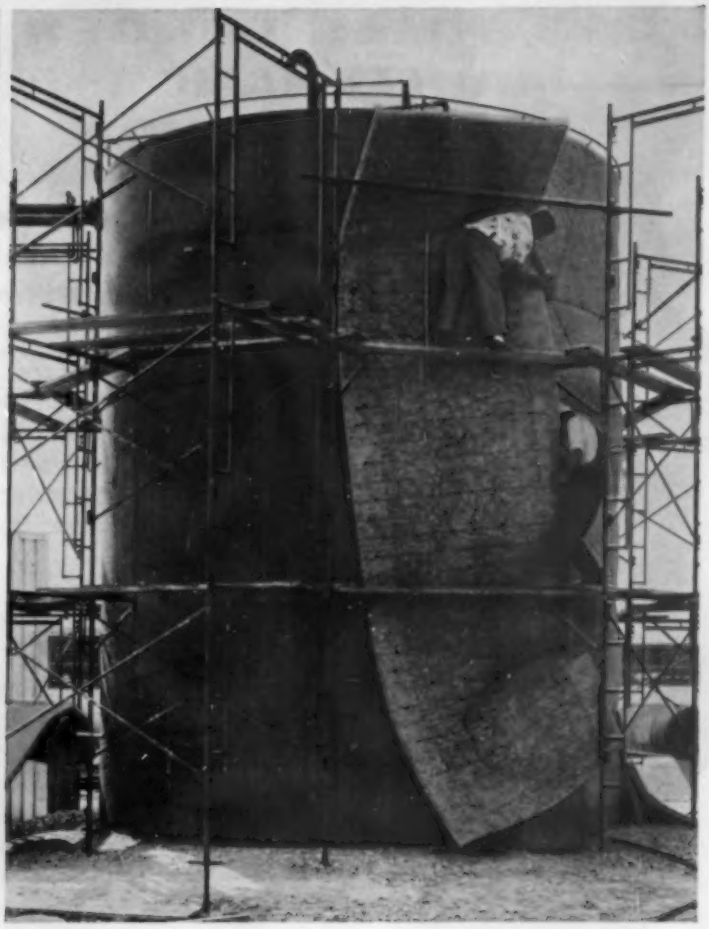
VALDOSTA, Ga., Baker Bros., Inc.
WASHINGTON, D. C., Walter E. Campbell Co., Inc.
WAYCROSS, Ga., Baker Bros., Inc.
WEST PALM BEACH, Fla., Southern Metal Prod.
WICHITA, Kans., Wichita Sheet Metal, Inc.
4-28-61





The fastest, most economical way to insulate tanks and towers: Ultralite® Glass Fiber Blankets

NO SPECIAL BANDING OR STRAPPING—Made exclusively of long, strong textile-type glass fibers that have ten times the tensile strength of steel fibers of the same diameter, Ultralite can easily support many times its own weight without special bands or straps.

FEWER MAN-HOURS FOR INSTALLATION — With continuous blankets up to 10′ wide you can cover, in one quick operation, a 10′ wide area from the top to the bottom of the tank. (Compare this to the man-hours it takes with blocks, boards or other fiber glass products in small sheets!) Ultralite is lightweight and easy to handle—1000 sq. ft. of 2″ Ultralite #75 weighs only 125 lbs.

OFTEN REQUIRES LESS THICKNESS — Ultralite's low "k" factor (.27 at 75° m.) allows you to save in another way. It takes less thickness of Ultralite to provide the same overall insulating efficiency of many other insulation materials. And with 10′ wide blankets there are fewer joints —a primary source of heat loss or gain with other insulation materials.

PERMANENT AS GLASS ITSELF — Ultralite's glass fiber composition does not rot, corrode, support mildew or vermin, or otherwise deteriorate. Because of its unique ruggedness, it is virtually immune to damage during and after installation. In fact, Ultralite can even be reused with no loss of thermal efficiency or permanence.

WRITE FOR COMPLETE INFORMATION, INCLUDING DETAILED APPLICATION METHODS, TODAY.

GUSTIN-BACON *Manufacturing Company* GUSTIN gb BACON

232 W. 10th St., Kansas City, Mo.

Thermal and acoustical glass fiber insulations . . . Molded glass fiber pipe insulation . . . Couplings and fittings for plain and grooved end pipe

Circle 642 on postcard, page 33

2-3 TIMES LONGER MAINTENANCE PROTECTION

Carboline CS-1161 System Uses Carbo Zinc 11* Inorganic Zinc as Primer

In this 3-coat system, each coat has special properties, each is designed to do a specific job. Proven in service, they team together to produce 2-3 times longer-lasting protection than vinyls with conventional primers.

Coat No. 1
CARBO ZINC 11

An inorganic zinc performing a double function—a primer and a tough protective coat in itself. Protects galvanically, bonds tightly to steel, eliminates undercutting. Can be applied in almost any kind of weather. Water-insoluble in 20 minutes, ready for intermediate coat in 4-6 hours.

Coat No. 2
RUSTBOND PRIMER 6

A corrosion-resistant tie or intermediate coat. Bonds securely to the inorganic zinc and provides a compatible surface for the topcoat. Only one hour drying time required.

Coat No. 3
POLYCLAD 933-1

An outstanding vinyl topcoat. Proven resistance to weathering, and to salt, acid or caustic atmospheres. Available in any color.

Upgrade your present maintenance protection—reduce your yearly maintenance costs. Write for new 4 page illustrated Bulletin 400, or discuss the advantages of Carboline CS-1161 with your Carboline Sales Engineer. Evaluate this system now!

*patent applied for

carboline COMPANY

MAINTENANCE COATINGS WITH EXPERIENCE

32-T Hanley Industrial Ct. St. Louis 17, Mo.

6107

Circle 643 on postcard, page 33

INDUSTRIAL FILMS

Making Movies in the Plant

"MOVIES AT WORK," a 16 mm color and sound production, illustrates the wide range of in-plant films which can be made at low cost with 16mm equipment. The advantages of "do it yourself" productions—to tailor films to meet specific problems—are emphasized.

In its 14-minute length, "Movies At Work" demonstrates that the motion picture is a valuable tool in industrial communications.

In-plant motion pictures can serve many causes. Among those illustrated in the film are safety instruction; time-motion analysis of specific jobs; slow-motion studies of machine operations to pinpoint trouble spots; training of new employees for assembly operations, or of regular employees in a new procedure—with the added advantages of narration by their foreman; supervisory and sales-training films in which "interviews" are staged to allow the subject to see himself as his contacts see him; time-lapse films for traffic studies or to determine the most efficient use of plant space; and filmed reports to supplement standard reports from branch operation managers.

"Movies At Work" may be obtained without charge for individual showings from the Audio-Visual Service, Eastman Kodak Co., Rochester 4, N. Y.

Steel Belt Conveyors

A NEW 30-minute, 16 mm, sound movie which illustrates and describes many of the uses of steel belt conveyors, is now available.

The movie shows steel belt conveyors handling sugar, clay, chocolate, ice cream, biscuits, cheese, peas, coal, iron ore, soap powders, engine pistons and human passengers. The belts are shown in warehousing, production, processing, shipping, receiving, sorting and related operations.

Many special applications for which the steel belt is particularly well suited are illustrated—plowing off bulk materials, back-logging metal parts, scraping off sticky substances, sorting materials, and conveying materials through high-temperature baking ovens, low-temperature cooling tunnels and up inclines. Also demonstrated is the ease with which the belts are cleaned and their resistance to wear and abrasion.

Arrangements for the use of the film can be made through Sandvik Steel, Inc., 1702 Nevins Road, Fair Lawn, N. J.

FOR John Doe Electric Company
C.O. NO. 43967 ITEM 2
F.O. NO. 2-A-3695 ITEM 2
NO. OF UNITS 30
BY JEH DATE 4/5/61
APP. ACL DATE 4/5/61

ANACONDA WIRE & CABLE CO.
ENGINEERING DEPARTMENT — ANACONDA — HASTINGS-ON HUDSON, N.Y.

UNIT PACKAGE JOINTING MATERIAL

STRAIGHT JOINT FOR TYPE CB PAPER-LEAD CABLE
ONE CONDUCTOR, SIZE 4/0 AWG ~~MCM~~
CONDUCTOR SHAPE ROUND
INSULATION THICKNESS .175" ~~.184"~~
LEAD SHEATH THICKNESS .090" ~~.164"~~
RATED VOLTAGE 15 KV ~~GRD. UNGRD.~~

NOTE:
REFER TO STEP-BY-STEP PROCEDURE FOR DETAILS OF STANDARD JOINTING OPERATIONS.

STEP NO.	LENGTH INCHES	TAPES TO REMOVE
7	—	—
6	—	—
5	6	CB TAPES
4	3 3/4	11
3	3	8
2	2 1/4	7
1	1 1/2	ALL

TRUCK CALL-BACKS ELIMINATED with ANACONDA UNIT JOINT PACKAGES
All materials necessary for a particular joint are included—matched to the job and to one another.
ASK THE MAN FROM ANACONDA FOR UNIT JOINT PACKAGES
61242

BILL OF MATERIAL CATALOG NO. 58111654-0-04

ITEM NO.	DESCRIPTION	QUANTITY PACKED	
1	LEAD SLEEVE 2" IN. I.D. x 16 IN. LG. x 8/64 IN. WALL	1	
2	SPLIT TINNED COPPER CONNECTOR, SIZE 4/0 AWG ~~MCM~~	1	
3	V.C. TAPE, 3/16 IN. WIDE x 4 YD. PER ROLL	1 ROLLS	OIL PACKED IN #300 SUPERSEAL
4	V.C. TAPE, 1/2 IN. WIDE x 4 YD. PER ROLL	1 ROLLS	
5	V.C. TAPE, 3/4 IN. WIDE x 4 YD. PER ROLL	2 ROLLS	
6	V.C. TAPE, 1 IN. WIDE x 4 YD. PER ROLL	9 ROLLS	
7	BAR SOLDER	1/2 LB.	
8	COPPER MESH TAPE, 3/4 IN. WIDE x 6 YD. PER ROLL	1 ROLLS	
9	FILLING COMPOUND, NO. 150 SUPERSEAL	2 PINTS	
10	WIPING SOLDER	2 LB.	
11	FLUSHING COMPOUND, NO. 250 SUPERSEAL	1 PINTS	
12	STEARINE FLUX	1 OZ.	
13	PAPER PASTER	4	
14	COTTON TAPE, 1 IN. WIDE x 3 YD. PER ROLL	1 ROLLS	
15	COTTON YARN 1/8 OZ. PER ROLL	1 ROLLS	
16	WASTE ENDS	2 OZ.	
17	ALOXITE CLOTH	1-1FT. ROLL	

Circle 644 on postcard, page 33

YOU CAN USE THIS!

BECAUSE PRICE IS IMPORTANT.

DON'T PAY FOR MORE THAN YOU NEED,

BUT DON'T PAY MORE AND GET LESS.

THE B&J TYPE GW STEAM TRAP GIVES YOU CONSTRUCTION AND PERFORMANCE FAR IN EXCESS OF ANY TRAP PRICED SO LOW.

- Discharges more condensate faster.
- Discharges more air faster.
- Operates with absolute uniformity.
- Priced with the lowest yet all working parts are monel and stainless steel.
- Only trap with factory assembled, calibrated and pre-tested replacement interior.
- There is a B&J thermostatic steam trap for almost every trapping job: pressures from vacuum to 300 PSIG, capacities to 25,000 lbs. per hour. Pipe sizes ½" to 2". Bronze, semi-steel, cast steel.

Don't take our word for it. Try a B & J steam trap for 30 days at our expense. Just tell us your capacity and pressure needs.

BARNES & JONES, INC.

34 Crafts St. • Newtonville 60, Massachusetts

Circle 645 on postcard, page 33

NEW BOOKS

for the plant engineer

Hydraulic Standards Revisions

FIRST REVISION TO STANDARDS OF THE HYDRAULIC INSTITUTE. Size about 11¾ by 11 in; loose-leaf sheets. Available from the Hydraulic Institute, 122 East 42nd St., New York 17, N.Y. Price $1.25.

LOOSE-LEAF SHEETS carry revisions to the 10th edition of the Standards of the Hydraulic Institute. Among the revised pages are some presenting reissued information. Pages are marked so that proper insertion into the original folder should be no problem.

Among the changes are those relating to: centrifugal pump application standards; rotary pump application standards; viscosity tabular data; and friction loss charts.

Radio Systems Registry

1961 REGISTRY OF INDUSTRIAL SYSTEMS edited by Ethel V. Sleeper. Size 11 by about 8½ in.; over 240 pp; paperbound. Published by Communication Engineering Book Co., Monterey, Mass. Price $5.00.

LISTINGS in this publication are presented in two groupings, according to licensees, and frequencies. In the first part names and addresses of licensees appear.

Information is also given in this part on the number of mobile units operated and call letters of such equipment as well as fixed transmitters.

In part two material is presented according to FCC frequency groups. Call letters are also given and other information takes in types of transmitters and service, and locations.

Industrial Buying

INDUSTRIAL PURCHASING. Size 9¼ by 6⅛ in.; second edition; 526 pp; cloth bound. Published by John Wiley & Sons, Inc., 440 Park Avenue So., New York 16, N.Y. Price $9.50.

AS IN THE approach used in making ready the first edition, there were several individuals involved in getting the second edition in shape for publication. In their efforts on the latter, Professors J. H. Westing and I. V. Fine of the University of Wisconsin had the cooperation of members of the Milwaukee Assn. of Purchasing Agents.

The following are among the chapter topics treated in this expanded and revised edition: the procedures, forms,

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LINK-BELT C CLASS CHAIN combines cast malleable center links with steel sidebars connected by steel pins. Broad tops and bottoms provide ample sliding surfaces for drag conveyors. Also available with Promal or "file-hard" Promal center links for extreme loads and abrasive wear. Promal is the special Link-Belt metal that lasts much longer . . . costs but little more.

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Circle 647 on postcard, page 33

NEW BOOKS

and records of purchasing; related problems in source selection; controlling the quantity of purchased materials; scrap disposal; legal aspects of purchasing; evaluating the performance of the purchasing department; and public relations in purchasing.

Radioactive Methods

SYMPOSIUM ON ALLIED RADIATION AND RADIOISOTOPE TEST METHODS. Size 9¼ by 6 approx; 112 pp; illustrated; hard paper bound. Published by the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. Price $3.75; members $3.00.

PAPERS on the use of radioisotopes for testing were presented at a regional ASTM meeting on the West Coast in 1959. Information from these presentations is made available in the book identified as ASTM Special Technical Publication No. 268.

Tests reported on at this meeting dealt with a variety of applications of radioactive materials. Among the test methods on which comments in this book appear are those relating to the following: Ring wear in railroad Diesel engines; removal of fatty soil from glass; measurement of moisture and density in soils; rapid determination of uniformity of mixing; and analysis of sulfur in hydrocarbons.

Dielectrics

DIGEST OF LITERATURE ON DIELECTRICS. Volume 23. Size 11 by 8⅜ in. approx; over 420 pp; paper bound. Available from the Printing and Publishing Office, National Academy of Sciences—National Research Council, 2101 Constitution Ave., Washington 25, D.C. Price $8.00.

IN THIS 1960 publication there are comments by various committee members on the accomplishments of numerous individuals whose names are listed in bibliographies at ends of chapters.

The book contains 12 chapters; among some of the titles of these are the following: molecular and ionic interactions in dielectrics; conduction phenomena in solid dielectrics; magnetic materials; rubber and plastic insulations; insulating liquids and their applications; and solid inorganic insulations.

One chapter containing a good bit of table material differs in general tenor with the presentations in the other sections. It includes dielectric constants, dielectric relaxation times, and dipole moments.

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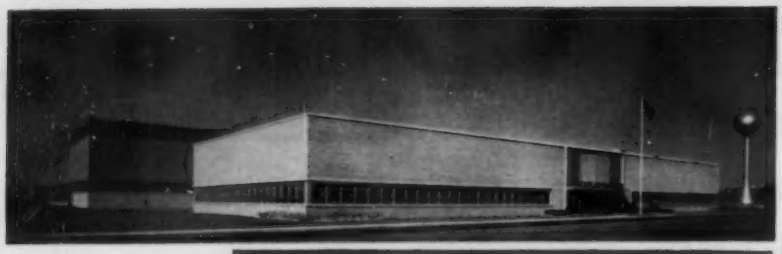

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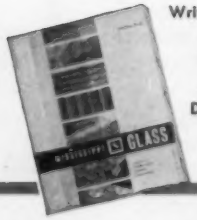

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How Lighting Affects Heating and Air Conditioning

(Continued from page 115)

remove this heat so as to achieve maximum efficiency of the lamps and to obtain the lighting level for which the system was designed.

Influence of lighting heat on the total heating system capacity required for a building varies with the lighting level, the type of light source, the efficiency of the lighting system, and the design of the building.

Air, when heated by the lighting system to 80 to 100 F could become valuable in helping to maintain a room temperature of 70 to 75 F.

With lighting heat available as a supplement to a heating system, reductions in capital investment for boilers, chimneys, and long distribution ducts are possible. Advantages of using lighting heat to supplement that from a heat-pump installation are particularly evident.

Heat pump size is usually determined by the winter heating load. In summer, the system must produce a maximum indoor-outdoor temperature differential of 15 to 20 F. Winter conditions call for a 70 to 75 F gradient. Because the heat-pump is a reversible unit that supplies both heating and cooling, it must be sized for the larger heating load, Fig. 13.

Obviously, substantial savings could be made if a supplementary source of heat were available for use with the heat-pump. More efficient reversible designs would result. Controlled heat from the lighting system can fill this need and improve heat-pump economy, Fig. 14.

Today, we have many 100-fc and 200-fc lighting installations and in some cases lighting levels have gone much higher. As this demand for higher lighting levels increases, integrated lighting and air-conditioning systems should offer substantial advantages in comfort, performance and economy. **End**

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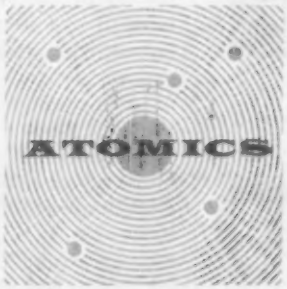

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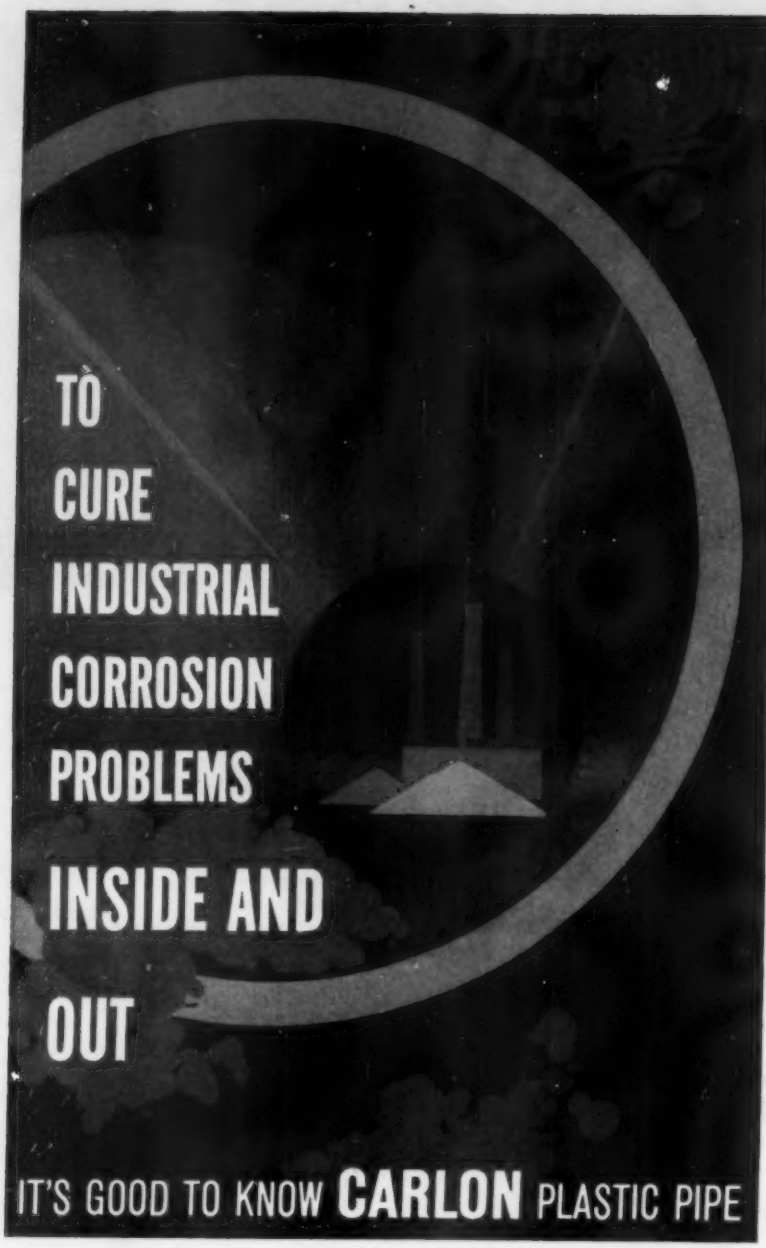

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Circle 651 on postcard, page 33

Lubrication Guide

(Continued from page 118)

sidered necessary. These rings range from the familiar adapter rings used with V-rings to metal-backed cups.

The choice of a packing is not an easy one to make, since thousands are available. A brief guide, however, might be useful:

Braided packings are manufactured from a variety of fibers, including cotton, flax, jute, ramie, asbestos (both blue and white), Teflon, rayon, nylon, and dacron. Some of these packings are equipped with metal jackets.

Metal makes a good bearing. When used around a core to make a foil jacket, shaft movement beyond that which a solid piece of metal can handle is normally expected. The core provides the resilient springback to the metal surface. Most such packings are used in rotary service or mild reciprocating work.

Coil and ring packings are fabricated from duck and rubber, and are generally used in reciprocating work. Occasionally, however, they come into service as end rings for rotary service as well.

Molded and automatic types of packings, some of which are reinforced with certain of the fibers mentioned above or they may be a homogeneous rubber compound, are generally recommended for use in reciprocating work.

Floating metal packing—segmental rings of packing generally held in initial contact with the shaft by means of a garter spring circling the surface of the ring—are manufactured of cast iron, bronze, phenolic, carbon, and Teflon. This type of packing is used almost exclusively for high pressure reciprocating work involving gases.

The standard oil seal employs a nitrile rubber element, although other elastomers and leathers are sometimes used. It is used more often for rotating service than for reciprocating service and is designed for "non-pressure" applications.

Mechanical seals, though expensive, are probably the most efficient packings. They are used exclusively for rotary service, and are manufactured from many materials and combinations thereof—metals, ceramics, plastics, elastomers, carbon, to list a few. **End**

PPG Fiber Glass Pipe Insulation is slit lengthwise, slips easily on to pipe. Delaware Insulation Company installed 15,000 ft of PPG Pipe Insulation in the new Wilmington High School, reported excellent working characteristics.

"We can install PPG Fiber Glass Pipe Insulation 15% faster than other pipe insulating materials"

says Mr. Anthony Kotowski, foreman, Delaware Insulation Company, Wilmington, Delaware

"A good worker can insulate 200 feet of pipe in one work day. But with PPG Pipe Insulation, he can insulate 230 feet in the same amount of time," reports Mr. Kotowski. "This helps us maintain tight construction schedules and saves money, too!

"We like PPG Fiber Glass Pipe Insulation because it's flexible and workable. We bend it around pipe hangers, mold it to shape easily, smooth it, then fasten and bind it," continued Mr. Kotowski as he discussed the PPG installation in a Wilmington High School. "You can't do that with other insulations. They're too brittle, require cutting, and sometimes break when you're working with them.

"PPG Pipe Insulation is easy on the hands, and it's not attacked by rodents. Of all the insulations on the market, PPG gives the neatest, quickest job."

GET TOP RESULTS WITH PPG

Fast installation, excellent thermal insulation, long service life, low maintenance . . . all these advantages are yours with PPG Fiber Glass Pipe Insulation. It's available in a full range of sizes, with or without facing.

For full information, contact your nearest PPG Fiber Glass Sales Office, or write *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Penna.*

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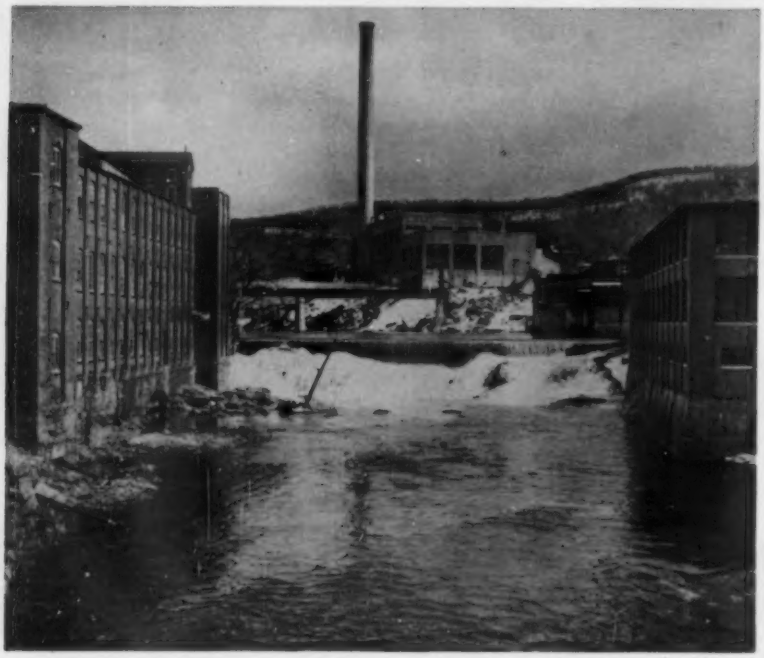
Circle 652 on postcard, page 33

at Ware Industries...

HAGAN COAGULANT AID CUTS CLARIFYING COSTS BY 53%



Ware Industries, Ware, Massachusetts, owns and operates this complex of buildings, leasing them to several textile manufacturers.

Quick case history — reading time 68 seconds

THE PLANT: Ware Industries owns and operates a group of huge manufacturing buildings. Tenants are textile manufacturers, most of whom produce high quality, pastel colored woolens. Ware provides building maintenance and power, steam and process water.

THE PROBLEM: Ware River water carries some plant effluent and heavy run-off from fields and forests. Color averages from 50 to 60 ppm, but may run as high as 80 to 90 ppm. Due to the delicate woolen colors produced, maximum tolerable water color is 5 ppm. The plants use 1½ million gallons of water per day, and clarification with alum and caustic soda had produced acceptable water, but chemical costs were high.

THE SOLUTION: After several unsuccessful attempts to use a coagulant aid, Hagan Coagulant Aid No. 323 was tried. Because it produces a larger, tougher floc that settles fast, the Hagan Aid proved to be the solution to the problem. Hagan Aids are easy to feed, are non-toxic and are available in a range of formulations to suit most water conditions.

RESULTS: Results were spectacular. Alum use fell from 1400 pounds per day to 500 to 600 pounds per day. Use of caustic soda also dropped. Only two quarts of Hagan Coagulant Aid are used per day. Chemical costs have been cut by 53%, nearly $10,000 annually.

WANT MORE INFORMATION on the ability of Hagan Coagulant Aids to solve clarification problems? **Write or phone for Bulletin HSP-919.**

Hagan Aid is measured prior to mixing.

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Circle 653 on postcard, page 33

Care of Scientists

(Continued from page 108)

off-harmony results. Example: given his color choice, one scientist in an eastern plant chose purple—because that's what he likes (management doesn't, and neither did maintenance painters who applied it, but this scientist thinks better surrounded by purple—and that's what he's paid to do).

Corridors with "Thought Space." Wide corridors, contend many plant specialists, are provoking of spacious thinking. Trend is toward 8 to 9-ft wide hallways. And not only that—but corridors with a view.

At Collins Radio Company's new Newport Beach, Calif. plant, lab corridors dead-end on patios—the vista expansive.

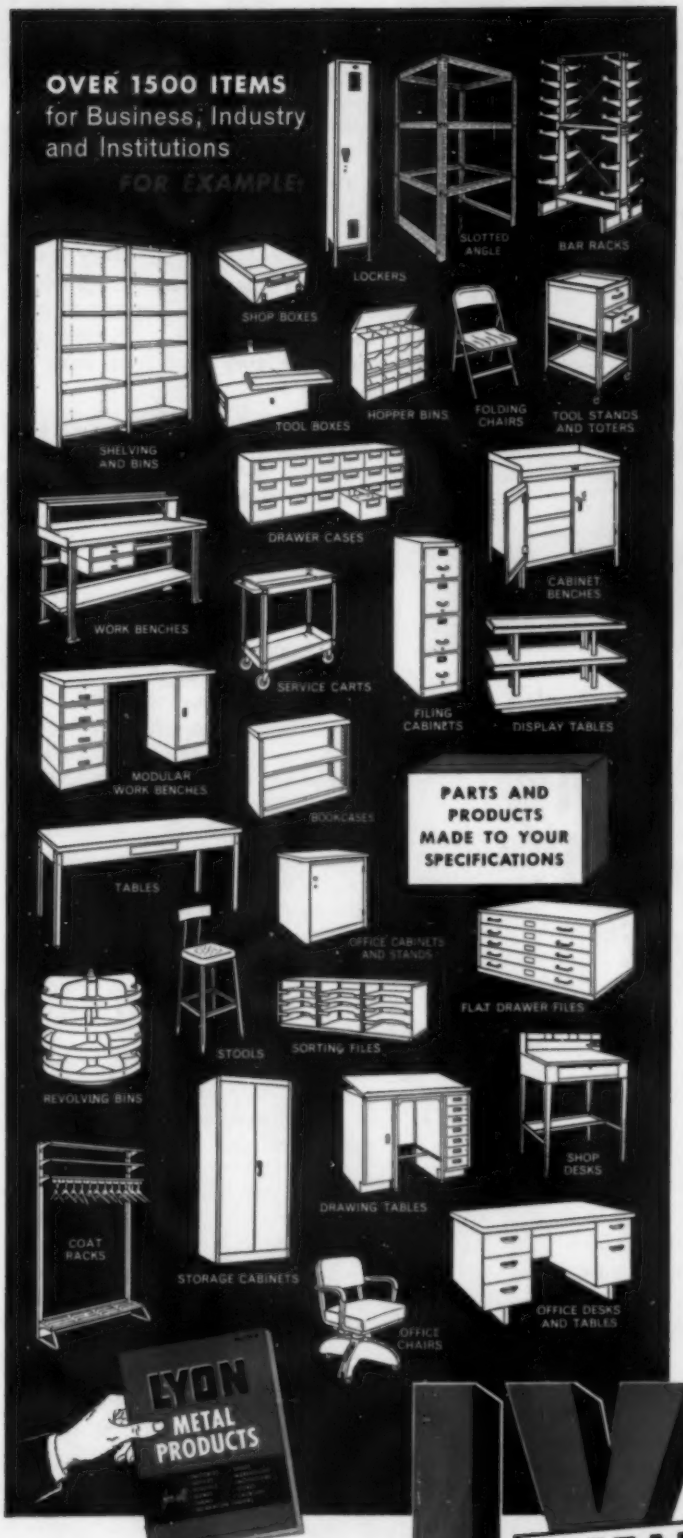
Another growing practice: exterior corridors, for even wider vistas and presumably, equal open-mindedness.

Offices—Neither Too Big Nor Too Little. In a dozen recent plant make-overs, scientists are grouped as teams (seldom more than 20 to 45 men teamed on one project), their usually two-man offices set either side of an open, between-office "support" area (where clerical and technical support people are desked).

The huge, sea-of-drawing-boards engineering offices of World War II are disappearing—condemned as not conducive to creative work. Out of favor, too, are the cubby-hole one-man offices (or even over-large offices which house but one scientist). Reason: such isolation deprives researchers and their projects of "intellectual cross-fertilization"—the in-office think session which often solves problems no researcher can solve by himself.

Opportunity for "cross-fertilization" is engineered into most new plant-labs. Commonly, two top-level men share an office, occasionally as many as four, and growing rarer is solitary confinement for research thinkers (though not, of course, for purely administrative scientists).

How Much Space for Expansive Thinking? Some lab-plants assign space by scientific status—150 sq ft to holders of masters degrees, 200 sq ft for PhD's. But, on the average, 125 to 150 sq ft seems best for "thinking." An office shared by two scien-



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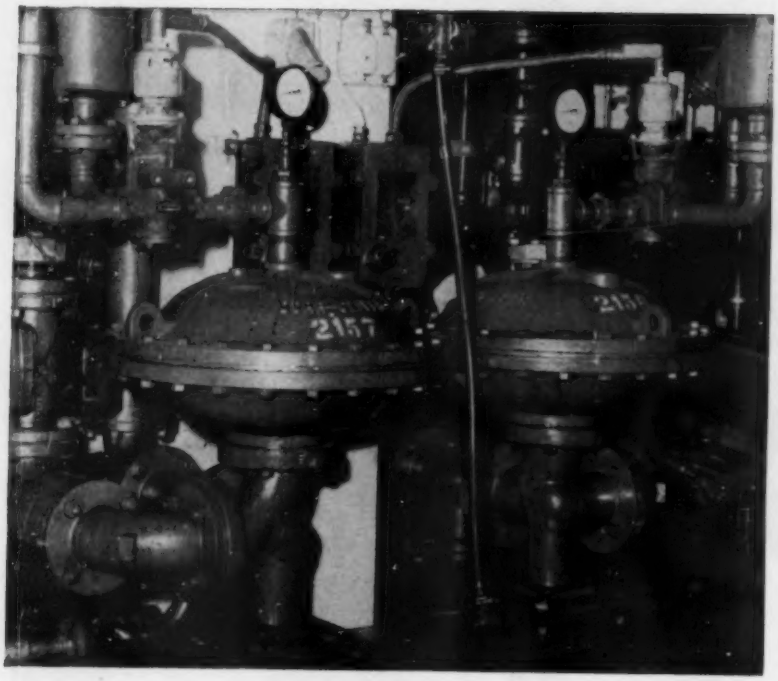

High solids pumping problem solved with

OLIVER DIAPHRAGM SLURRY PUMPS

. . . at Toms River Chemical Corp.

At the new plant of the Toms River Chemical Corporation (formerly Toms River Cincinnati Chemical Corp.), Toms River, N. J., production of organic dyes and pigments involves transfer of liquids with a high solids content. The job is handled by 21 Oliver Diaphragm Slurry Pumps, two of which are shown above.

ODS operation requires no mechanical drive or linkage. The diaphragm gets its impulses pneumatically, controlled by the action of a 3-way solenoid valve. There is no stuffing box to wear or leak. Slurries containing up to 85% of solids can be handled efficiently, with minimum expense for pump maintenance.

The ODS pumps at Toms River Chemical Corporation are designed with space-conserving side outlet base tees. Selection of ODS pumps was based on the excellent performance of previously purchased units used in other plant operations.

Dorr-Oliver offers a complete line of pumps for specialized applications, including slurry transfer, acid handling and food processing. For full data, write to Dorr-Oliver Incorporated, Stamford, Connecticut.

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WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

ODS—T.M. DORR-OLIVER, INCORPORATED

Circle 655 on postcard, page 33

tists would contain 250 to 300 sq ft.

Some prodigy "Do's" and "Don'ts". Here are some plant engineering rules for the care and maintenance of scientists:

Don't, without pre-arrangement, intrude routine plant maintenance —lamp changing, window washing, floor polishing—upon thinkers. Where possible get the work done after-hours (even then, a problem may arise, since many top-level men keep nocturnal hours . . . may get their best work done from noon to midnight).

Don't risk offending scientific "freedom of choice" . . . which encompasses such seemingly routine decisions as what color paint where, and when; office name-plating . . . whose name, if any, gets top billing; whether solid office partitions or transparent glass (some scientists respond to glass walls. Others cringe at the thought of a corridor passersby invading their privacy).

Don't make any decision until you've thought through psychological consequences . . . and have tentatively broached the idea to the scientists most directly affected.

Do think in terms of engineering "bigness"—wider corridors, unobstructed vistas, off-lab patios, college-campus landscaping and ways and means of achieving (1) low noise level; (2) think area versatility—such as movable partitions, a popular means of periodically changing scientific vistas.

Do partition all toilets, provide mirrors (full length) and "freedom of choice" faucets for hot as well as cold water.

Do engineer for the "whole man." Consider the effect upon his creativity of too-narrow parking stalls; of off-lab eyesores (signs not in keeping with laboratory dignity); and the "approach affect" of the lobby, lobby-to-office corridors—and the view from his office window.

For not without reason must plant engineers heed industry's newest admonition: "Scientists at Work: Handle With Care." **End**

Want Tear Sheets?

If you would like tear sheets of any articles appearing in this issue, just drop a line to The Editor, Plant Engineering, 308 East James St., Barrington, Ill.

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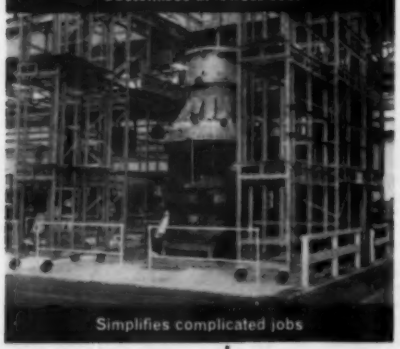

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All factors considered—initial cost, assembly savings, design versatility and 100% reusability potential—you'll come out way ahead with Acme Steel Slotted Angle.

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Circle 656 on postcard, page 33

BULLETINS

(Begins on page 31)

VALVES AND FITTINGS

Ball Valves for Reduced Maintenance

Catalog 1200, 32 pp, describes manual and pneumatically operated ball valves in sizes ¼ through 12 in. Provides design features on McCannaseal and McCannaflo valves, operators. Includes dimensions, pressure-temperature ratings, and material recommendation chart covering about 200 chemicals. Hills-McCanna Co.

For a copy, circle 146 on Post Card

Valve Flow Characteristics

Methods for determining flow characteristics of lubricated plug valves and venturi type valves are detailed in 20-pp Bulletin V-602. Tells how to calculate pressure drop, includes pressure drop curves and sample cases. Nordstrom Valve Div., Rockwell Mfg. Co.

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Semi-Steel Valves, Accessories

Specifications and dimensions for all sizes of semi-steel straightway, steam jacketed, multiport and special order valves and accessories are given in 44-pp Bulletin V-203. Nordstrom Valve Div., Rockwell Mfg. Co.

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The problem common to all buried or submerged metals is corrosion. Electro Rust-Proofing stops corrosion . . . stops it permanently, efficiently, economically.

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E.R.P. is a firm of specialists in corrosion prevention. E.R.P. research for over 25 years has developed new metals, new techniques, lower costs for cathodic protection. To put them to work for you, write Dept. E.57.72.

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30 MAIN STREET, BELLEVILLE 9, NEW JERSEY
CABLE ADDRESSES: ELECTRO, NEWARK, N. J. • WATSAGENE, LONDON

Circle 657 on postcard, page 33

Cast Iron, Malleable Unions, Fittings

Design, weight and dimensions of unions and union fittings are detailed in 16-pp Catalog 57. Engineering specifications included. Stockham Valves & Fittings Co.

For a copy, circle 150 on Post Card

HEATERS, HEAT EXCHANGERS

Industrial Strip Heaters

Factors to be considered in selecting strip heaters are detailed in 12-pp Catalog C-300, along with general dimensions of general purpose and finned-type heaters, specification tables. The Bryant Electric Co.

For a copy, circle 152 on Post Card

Hot Water Storage Tank Heaters

Sixteen-pp Catalog 602 describes steel, cement lined, copper lined, and solid copper-silicon tanks, as well as heating elements for them. Old Dominion Iron & Steel Corp.

For a copy, circle 153 on Post Card

Pre-Engineered Heat Exchangers

Shell and tube exchangers using standardized components for petroleum, petrochemical and chemical industries are featured in 24-pp Bulletin 101. Includes engineering data, design, construction and assembly details. The Griscom-Russell Co.

For a copy, circle 154 on Post Card

INSTRUMENTS, CONTROLS

Why Custom Control Systems

Coordinated systems for process control, power plant control, machine and motor control shown in 8-pp Bulletin 203. Electro-Mesh Corp.

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For Low Cost Data Transmitting

Indicating and remote control applications of selsyn monitoring systems are described in 6-pp Bulletin GEA-7218. Describes use of cam-operated limit switch as automatic feedback control. General Electric Co.

For a copy, circle 156 on Post Card

On Miniaturized Electric Eyes

Bulletin 611, 22 pp, covering all phases of electric eyes in automation is both an "answer book" on problems and reference manual on photoelectric controls. Presents miniaturized light sources, photo units, controls, timers. Photomation Inc.

For a copy, circle 157 on Post Card

Dial Indicators for Weighing

Cabinet and pillar dial operators are illustrated and described in 8-pp Bulletin 8014. Cutaway photos show details of Floaxial mechanism. Fairbanks, Morse & Co.

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Speed Measuring Systems

Twelve-pp Bulletin GEZ-3251, 12 pp, describes a-c and d-c tachometer gen-

Four to choose from
in high-voltage power cable

You can match precisely the conditions your high-voltage power cable is exposed to when you specify Rome.

The reason is simple: Rome offers both oil-base and butyl-base insulation as well as a choice in jacketing.

Four of the more popular combinations are: (1) Rozone inside . . . Roseal outside, (2) Rozone A inside . . . Roseal outside, (3) Rozone inside . . . Roprene outside, (4) Rozone A inside . . . Roprene outside.

With *Rozone* you have a premium oil-base insulation with high resistance to corona, ozone and water, as well as high dielectric and impulse strength. *Rozone A* (butyl-base) has excellent ozone resistance and also protects against extremes in temperature.

• In jacketing, *Roseal*, a thermoplastic compound, provides excellent mechanical and weather protection. It also resists abrasion, heat, flame, moisture, oils and most chemicals. It is recommended as a nonmetallic sheath over shielded and unshielded power cable and can be used underground or overhead.

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Need high-voltage cable now? Rome offers "off-the-shelf" delivery for many types. Get all the facts from your area sales office. Or write to Rome Cable Division of Alcoa, Dept. 5-61, Rome, N. Y.

ALCOA
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DIVISION

Circle 658 on postcard, page 33

RIDGID
65R-TC RATCHET THREADER

with new True-Centering Workholder

Gives Better Threads Faster 4 Ways!

Here's Why:

One set of dies threads 1", 1¼", 1½" and 2" pipe and conduit . . . no dies to change. • Fast-to-set, True-Centering Workholder centers dies for true threads every time • Easy adjustment for accurate "drip" threads • It's jam-proof . . . automatic kick-out—prevents jamming.

RIDGID 65-RC with Cam-Type Workholder Also Available.

Call your Distributor today. For your convenience, he maintains a complete stock of RIDGID Work-Saver Pipe Tools and parts!

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Circle 659 on postcard, page 33

BULLETINS

(Begins on page 31)

erators and indicators, covering applications, calibration, accuracy and selection. Specifications, schematics and photos of systems included. General Electric Co.

For a copy, circle 159 on Post Card

Electronic Combustion Controls

Twenty-pp Bulletin 1002 describes oxygen analyzers, flow meters, draft gages, control valving, interlock switches and flame safeguard equipment. Covers factors to consider in selecting electronic control equipment. Reliance Instrument Div., Electro-Mech Corp.

For a copy, circle 160 on Post Card

Combustion Control System Use

Bulletin 1001, 32 pp, details the systems engineering approach to combustion control. Selection of electronic equipment and components is covered and typical proportioning and metering control systems are described. Reliance Instrument Div., Electro-Mech Corp.

For a copy, circle 161 on Post Card

Air Gage Engineering Guide

Basic design data and selection information on air gages from the simplest manual gaging to the complex post-process, in-process and automatic gaging, are in 32-pp Catalog 61. Standard Gage Co., Inc.

For a copy, circle 162 on Post Card

CHAIN

Customized, Standard Sling Chains

Featured in 20-pp Catalog S-261 are Cam-alloy, wrought iron and steel sling chains, also new Sentry chains with overload warning ring. Includes tips on care and use of sling chains, coding symbols. Campbell Chain Co.

For a copy, circle 164 on Post Card

Simplified Chain Selection

Recommended chain pitch size for power transmission chain is determined on this wall chart by locating intersection of design horsepower (on vertical axis) with rpm speed for small sprocket (on horizontal axis). Foote Bros. Gear & Machine Corp.

For a copy, circle 165 on Post Card

TOOLS, HARDFACING AND MACHINE SHOP

Illustrated Tool Buyers' Guide

Line drawings of screw drivers, nut drivers, pliers, wrenches, and specialty tools along with data and prices and simplified stock numbering system make 16-pp Buyers' Guide 164 a handy reference aid. Vaco Products Co.

For a copy, circle 166 on Post Card

Hardfacing Electrodes, Wires

Cross-referenced pictorial data on hardfacing materials classified according to use is presented in 44-pp Form ADC 955. Lists equipment parts that benefit from hardfacing, type of wear and alloy needed to protect it. Air Reduction Co., Inc.

For a copy, circle 167 on Post Card

Operator Training Manual

Basic training for the multiple spindle automatic bar machine operator is offered in this 34-pp compilation of articles covering elements of machine construction, collets and cams, setup preliminaries, tool setting, etc. Greenlee Bros. & Co.

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OTHER EQUIPMENT

Pneumatic Products for Industry

Catalog 1000, 64 pp, discusses benefits of proper compressed air processing. Describes compressed-air-line filters, pressure regulators, air-line lubricators, valves. Includes compressed air flow chart, dimensional data. C. A. Norgren Co.

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Heavy Duty Power Sweeper

Illustrated Bulletin 85.26 shows operation and unitized construction features of a power sweeper designed to sweep a 53-in. path and pick up both heavy litter and fine dust in single operation. G. H. Tennant Co.

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This Wayne Power Sweeper and its operator are saving on *more* than plant maintenance alone. Not only do they cut plant clean-up time and eliminate costly push broom methods—but provide these *extra* advantages as well . . .

—You can clean more plant area more often, saving on damage to machinery from dust and dirt.

—You protect rolling stock against tire and caster damage.

—You maintain the sparkling surroundings your employees want and need for best efficiency.

There's hardly a spot where Waynes can't go. They work right up to machinery . . . in congested areas . . . on loading docks . . . in parking lots . . . on sidewalks—wherever debris accumulates. They pick up everything from fine dust to pop bottles—and never raise a dust cloud while doing it! *In most plants, one man and a Wayne can handle the entire sweeping program and still free the operator for other work!*

There's just one side you can choose in your own plant picture—*the Wayne clean side.* A wide range of Wayne Sweeper models are made to meet your particular plant needs . . . to cut your plant housekeeping costs.

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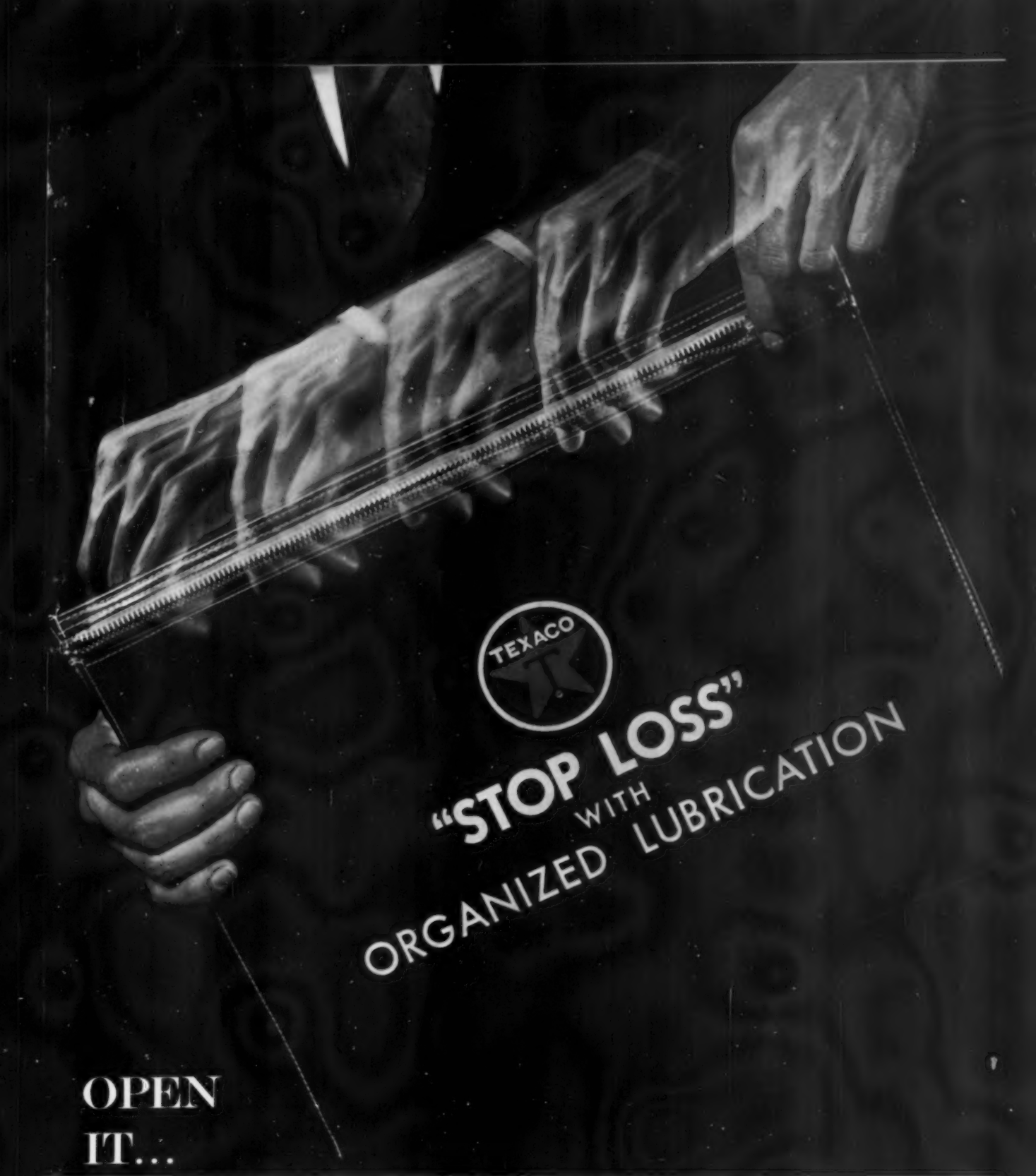

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a LINE of 500 psi quality steel swivel joints

APPLY THIS ECONOMICAL

CHIKSAN LFS SERIES SWIVEL JOINT

TO A WIDE RANGE OF LINE FLEXIBILITY NEEDS

Equally effective on lines handling water, hot liquids, fuels or gas, the new Chiksan LFS series joint has many features to commend its use. Sweep radius minimizes flow turbulence. Bearings are factory lubricated—usually sufficient, in normal service, for the life of the joint. In-stream packing is not affected by line surge or vacuum conditions. Fabricated from carbon steel, LFS series swivel joints have a temperature rating of 225°F and up to 400°F with Viton A packing. Available in sizes of 1½" to 4" in eight basic configurations. For more facts on this economical Chiksan LFS series joint, please request Bulletin 11-60.

CHIKSAN

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#61-58

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Offices and Representatives in Principal Cities of the World

Circle 662 on postcard, page 33

AVAILABLE from Advertisers

Guide to literature offered this month in ads received by PLANT ENGINEERING before the first of last month

ELECTRICAL

Instant Production Power—Information on induction motors with reliable performance. Georg Von Opel Corp.
Circle 201 on Post Card

Motor Maintenance—Flexible abrasives and brush seaters are described in catalog. Ideal Industries, Inc.
Circle 202 on Post Card

Dry-Type Transformers — Bulletins on transformers, substations, d-c saturable reactors. Sorgel Electric Co.
Circle 203 on Post Card

Secondary Unit Substations—Engineering data in Handbook PSG-559. Pennsylvania Transformer Div.
Circle 204 on Post Card

To Match Conditions—Selection facts on four types of high-voltage power cables. Rome Cable Div.
Circle 205 on Post Card

Specialized Bus Duct—Suggestions on eight types of bus duct for every use. Westinghouse Electric Corp.
Circle 206 on Post Card

Voltage Problems?—Information on the Inductrol regulator for voltage control needs. General Electric Co.
Circle 207 on Post Card

Power Factor Correction Capacitors—Literature gives details on these capacitors. Sprague Electric Co.
Circle 208 on Post Card

Compact Control Centers—Facts on selection in "Motor Control Center Handbook." Cutler-Hammer, Inc.
Circle 209 on Post Card

Power Switching—Bulletin 32-750 describes Type DSF metal-enclosed load-interrupter switchgear. Westinghouse Electric Corp.
Circle 210 on Post Card

Built To Take It—Information on heavy-duty switches for the tough jobs. General Electric Co.
Circle 211 on Post Card

Fault Protection without Fuses—Bulletin 8130 gives details on fuseless starters. Square D Co.
Circle 212 on Post Card

Fir Switchgear Protection—Bulletin AR-102 covers AutoCal Unitized Power-Pack. C & D Batteries Div.
Circle 213 on Post Card

Repair Problems?—Bulletin B-8223 "Maintenance Modernization Means Profits" defines services. Westinghouse Electric Corp.
Circle 214 on Post Card

Junction Boxes—**All Kinds**—Catalog covers "GR" Series junction box. Killark Electric Mfg. Co.
Circle 215 on Post Card

Oil-Tight Operators—All-Metal Push Buttons with color inserts shown in Bulletin 9001-T. Square D. Co.
Circle 216 on Post Card

Install Wireways Faster — Lay-in Duct is described in literature. Square D. Co.
Circle 217 on Post Card

LUBRICATION

Lubrication Problems?—Details on services offered regarding lubrication and maintenance. American Oil Co.
Circle 218 on Post Card

Efficient Machine Lubrication—Grease, fluid-type lubricants detailed in "Lubriplate Data Book." Fiske Brothers Refining Co.
Circle 219 on Post Card

INSTRUMENTS, CONTROLS

Mercury Actuated Controls—Condensed catalog presents temperature controls. The Partlow Corp.
Circle 220 on Post Card

Contents at-a-Glance—Dial-type liquid level gages are described in literature. The Liquidometer Corp.
Circle 221 on Post Card

To Measure with Accuracy—Catalog 2008 describes U-tube manometers. King Engineering Corp.
Circle 222 on Post Card

Easier Speed Reading—Information on versatile Series 26 Hand Tachometer. Metron Instrument Co.
Circle 223 on Post Card

See Motion without Blur—Speed measurement, motion analysis discussed in bulletin. General Radio Co.
Circle 224 on Post Card

MECHANICAL POWER TRANSMISSION

For Power Transmission—Catalog 760 describes roller chain, sprockets, flexible shaft, couplings available from stock. Diamond Chain Co., Inc.
Circle 225 on Post Card

In Matched Lengths—Technical information on all types of Green Seal V-belts. Goodyear Tire & Rubber Co.
Circle 226 on Post Card

PUMPS, COMPRESSORS

Two-Way Protection—Bulletins 1440A, 1442 describes centrifugal pumps with built-in safety features. Dunham-Bush, Inc.
Circle 228 on Post Card

Reversible Pumps—Catalog 61 SZ describes and lists advantages of Viking pumps. Viking Pump Co.
Circle 229 on Post Card

Sliding-Vane Compressors — Details on low-noise, low-maintenance compressors. Allis-Chalmers Mfg. Co.
Circle 230 on Post Card

Two-Stage Compressor—Details on two-stage stationary compressor that minimizes downtime. Le Roi Div.
Circle 231 on Post Card

Dependable Compressor — Bulletin 185 describes balanced/opposed compressor line. Clark Bros. Co.
Circle 232 on Post Card

PACKINGS, SEALS, WASHERS

More Protection per Dollar—Chempro Teflon packings described in Bulletin CP552 with prices. Chemical & Power Products, Inc.
Circle 233 on Post Card

Lattice Braid—Economical Teflon pump packing is described in Bulletin AD-185. Garlock, Inc.
Circle 234 on Post Card

Of Nylon Composition—Pumcups for controls, cylinders, pumps are described in Bulletin 5903. Darling Valve & Mfg. Co.
Circle 235 on Post Card

Trouble-Free Operation—Concave Neoprene cushion washers covered in Catalog O. Good Mfg. Co., Inc.
Circle 236 on Post Card

FANS, VENTILATING

Quiet, Space-Saving Fans—Catalog describes Centriline fans. Westinghouse Electric Corp.
Circle 237 on Post Card

Keep Out the Rain — Weatherproof roof ventilators with powerful exhaust covered in Bulletin 680—P. E. Robbins & Myers, Inc.
Circle 238 on Post Card

Air Moving Equipment — Bulletin 261A tells "Who's Who in Certified Performance Ratings." Air Moving & Conditioning Association, Inc.
Circle 239 on Post Card

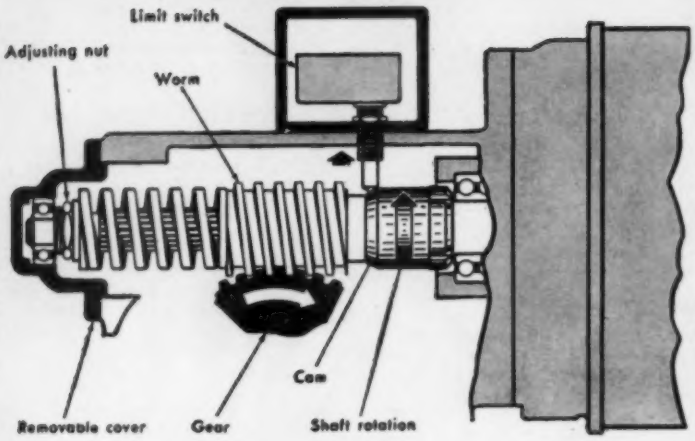
MATERIALS HANDLING

Something New—Catalog on cranes with pre-engineered components. Manning, Maxwell & Moore, Inc.
Circle 240 on Post Card

Aluminum, Steel Hoists—Bulletins DH-164, DH-345 give details on Safeway Hand Hoists. Wright Hoist Div.
Circle 241 on Post Card

Postage-free cards for ordering literature are on pages 33-34.

NOW POSITIVE PROTECTION for MOTORS and MACHINERY



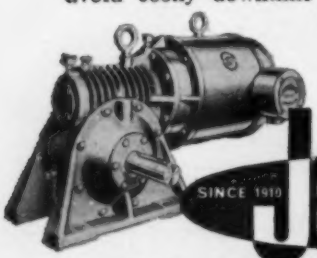
As long as applied torque is within pre-determined limit, spring bears against end of worm and holds it centered on gear. Excessive torque causes worm to move axially along splined motor shaft, compressing spring and bringing cam surface in contact with limit switch which cuts power, stopping motor.

...JANETTE Adjustable Torque Overload Cutout

Here's *dependable* protection for drive units, driven mechanisms, personnel, and work in progress . . . and a sure-fire way to reduce down-time.

Janette Adjustable Torque Overload Cutout is far more sensitive than conventional shear pins, or friction clutches and similar devices. Its sliding worm on a spline shaft (described above) assures shutdown of the driving motor within closely controlled torque overload limits. Unit is easily reset when cause of overload is removed.

Color-coded, interchangeable springs permit selection of a wide range of torque limits. Each spring has a simple linear adjustment over its own range. Protect *your* equipment and avoid costly downtime the *positive* way . . . with Janette Adjustable Torque Overload Cutout. Write today for Bulletin 5-7.



SINCE 1910 Janette GEAR MOTORS MOTORS SPEED REDUCERS

Division of National Pneumatic Co., Inc., Boston 19, Mass.

Circle 663 on postcard, page 33

Speed Production, Cut Costs—Details on how Lo-Hed Hoists and Car Pullers can do this. AE Industrial Div., Aircraft Armaments, Inc.

Circle 242 on Post Card

Coil Handling Economy—Motorized coil lifters are discussed in Bulletin SL-32. Cullen-Friestedt Co.

Circle 243 on Post Card

Dumping Hopper—Details in a hopper that automatically dumps, rights and locks. Roura Iron Works, Inc.

Circle 244 on Post Card

Shock-Resistant Wheels—Information on steel disc wheels with polyurethane tires. Jarvis & Jarvis.

Circle 245 on Post Card

STORAGE

Iron-Grip Shelving—Reference Manual 487 and "How to Solve Your Storage Problems" gives details. Equipto.

Circle 246 on Post Card

Planned Shelving, Lockers—Information in "12 Losses Penco Planning Can Control". Alan Wood Steel Co.

Circle 247 on Post Card

Steel Equipment—Catalog illustrates over 1500 items—shelving, cabinets, etc. Lyon Metal Products, Inc.

Circle 248 on Post Card

COOLING, AIR CONDITIONING

Air Conditioning Units—Bulletins FM2345, UH130, AC212, AC220 and "Zone Conditioning" cover major types. Buffalo Forge Co.

Circle 249 on Post Card

Low Cost Cooling—Bulletin DFC-61 describes Dri-Coolers, also water cooling towers. The Marley Co.

Circle 250 on Post Card

CONSTRUCTION

Colored Structural Sheets—Data on asbestos-cement sheets with Kolor-Mate finish. Keasbey & Mattison Co.

Circle 252 on Post Card

Heat Absorbing, Translucent Glass—Catalog give information on Coolite. Mississippi Glass Co.

Circle 253 on Post Card

Ready for Erection—Details on expanded metal interchangeable partitions with Quik-erect clips. Globe Co.

Circle 254 on Post Card

Safety Underfoot—A. W. Super Diamond safety floor plate is described in Bulletin SD-S3. Alan Wood Steel Co.

Circle 255 on Post Card

Industrial Roof Shingles—Fact Folder on shingling industrial plant roofs. The Philip Carey Mfg. Co.

Circle 256 on Post Card

LIGHTING

More Light, Same Cost—Information on the lighting cost reduction plan. Westinghouse Electric Corp.

Circle 257 on Post Card

HOUGHTON CYLINDER AND ROD PACKINGS

What makes a good replacement packing?

In the maintenance of hydraulic and pneumatic equipment, the cost of the packings is relatively insignificant compared to production losses while the equipment is shut down plus the direct labor to install them.

For these reasons, maintenance men take every precaution to see that the replacement packings they install will provide the longest possible service life. Where operating temperatures do not exceed 200°F. (and most are below this temperature), this means *leather* . . . Houghton VIM leather packings. For temperatures from 200°F. to as high as 600°F. it generally means Houghton VIX-SYN fabricated rubber packings.

The important EXTRAS you get in Houghton VIM leather packings lie in quality of hide, special tanning, thorough impregnation and proven design.

What to look for in leather packings

Despite recent advances in rubber, synthetic and other packing materials, leather—probably the first packing material ever used—is still the most efficient and most economical packing for a wide variety of hydraulic and pneumatic applications.

In some few cases, maintenance men may fail to appreciate the great *economy* of first quality leather packings which assure efficient operation, exceptionally long service life and therefore, a very minimum of downtime.

VIM leather packings have long been recognized for their exceptionally long service life. This record is due to the rigid standards to which they are made. This involves careful selection of the hide, special mineral tannage, proper packing design and precision manufacture.

Impregnants are another important factor in evaluating leather packings. Until recently, wax was the only impregnant. Now, however, Houghton has perfected leather packings thoroughly impregnated with synthetic rubber. These packings (cups, U's, flanges or V's) assure you the excellent sealing qualities of rubber together with the low friction, long life and anti-extrusion qualities of leather.

Fabricated rubber for higher temperatures

Where temperatures consistently run above 200°F.—even as high as 600°F.—and where pH would affect the leather fibers, the best maintenance packing bet is fabricated rubber. VIX-SYN fabricated rubber packings are made in V and cup types using either duck or asbestos fabric and a wide range of rubber compounds.

Both laboratory testing and field experience have proven that Houghton VIX-SYN packings last longer. This longer service life is due to the quality of materials used and the method of manufacture. The lip bevel is molded—not cut. This procedure insures an unbroken coating of rubber at the bevel which seals against "wicking" action and they are coated with silicone oil for easy installation. Flake graphite is not used.

Another exclusive feature of VIX-SYN fabricated "V" packings is that they are made to standard J.I.C. stack heights. This means that they can be used to replace either homogeneous rubber or leather V's without need for spacers or other gland changes.

When efficiency and long service life are of prime importance—as they are to maintenance personnel—take advantage of the proven superiority of Houghton VIM leather or VIX-SYN fabricated rubber packings. Remember—it costs no more to install the best packings—packings that will multiply the time interval between necessary changes. Ask your Houghton Man or write for bulletins on VIM leather and VIX-SYN fabricated rubber packings. E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

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Circle 664 on postcard, page 33

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UNIT LINE ends packing box or mechanical seal failures forever.

How "Liqui-Seal" seals itself

Here's a pump that seals itself by hydraulic action, thus putting an end forever to leaking packing boxes and mechanical seals.

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Gasoline; Jet Fuel; Corrosive Liquids; Kerosene; Light Oils; Salt Water

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Condenser Circulating and Cooling
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Pump is always primed
Takes minimum floor space
Mounts easily on ASA Standard flanges or on sump covers
Lubricated by fluid being pumped, thus eliminating any possibility of contamination

For complete details contact your nearest Johnston Distributor or write direct to the factory for colorful bulletin.

JOHNSTON PUMP COMPANY

968S E. Foothill Blvd., Pasadena, Calif.

Circle 665 on postcard, page 33

Time-Saving Troffers — Information on Shallow-Line. Thomas Industries.
Circle 258 on Post Card

MAINTENANCE

Color Survey Service—"Quick Reference Guide" plus "How to Reduce Painting Costs". Barreled Sunlight Paint Co.
Circle 259 on Post Card

Vacuum Systems — Built-in systems, and cleaners are described in Catalog 155B. The Spencer Turbine Co.
Circle 260 on Post Card

Power Cleaning Machines — Catalog and specifications data cover features. The National Super Service Co.
Circle 261 on Post Card

Drains Plugged?—Details on power cleaners. Kollmann Mfg. Co., Inc.
Circle 262 on Post Card

CHAIN, WIRE ROPE

Job Proved Chain—Catalog gives details on transmission and conveyor installations. Atlas Chain Mfg. Co.
Circle 263 on Post Card

Sling Do's and Don't's—"Tuffy Tips" and "Tuffy Sling Handbook" give safety tips. Union Wire Rope Corp.
Circle 264 on Post Card

TOOLS AND METALLIZING

Tools, Shop Equipment—This 128-pp Hand and Power Tool Guide makes it easy to order. Snap-On Tools Corp.
Circle 266 on Post Card

Saws with "Burnout Protection" — Information on power saws with 12 improvements. Skil Corp.
Circle 267 on Post Card

Why Metallizing—Bulletin 15 explains time- and money-saving advantages of metallizing. Metco, Inc.
Circle 268 on Post Card

PLANT SECURITY

No Upkeep—Catalog describes all-aluminum fence. Anchor Fence.
Circle 270 on Post Card

Automatic Protection — Information on security services detailed in booklet. American District Telegraph Co.
Circle 271 on Post Card

SPACE, PROCESS HEATING

Direct Gas-Fired Heaters—Handbook "Industrial Applications of Direct Gas-Fired Heaters." Reznor Mfg. Co.
Circle 272 on Post Card

Heating Units—Water Heating Bulletin PD-105, Process Catalog 60, Heating Catalog F-975D give data. Edwin L. Wiegand Co.
Circle 274 on Post Card

Industrial Ovens — Details are contained in the complete general catalog. Gallagher-Kaiser Corp.
Circle 275 on Post Card

THIS FREE BOOK COULD HELP PREVENT AN ACCIDENT WHERE YOU WORK

You owe it to yourself, and the men you supervise, to learn all about the safety, comfort, and economy of USS Multigrip Safety Floor Plate. This free booklet illustrates the many applications for Multigrip—from plant floors to derrick platforms to ship ladders. What you see in these pages may help prevent an accident in *your* future. For a personal copy of the USS Multigrip booklet, fill out the coupon at right.

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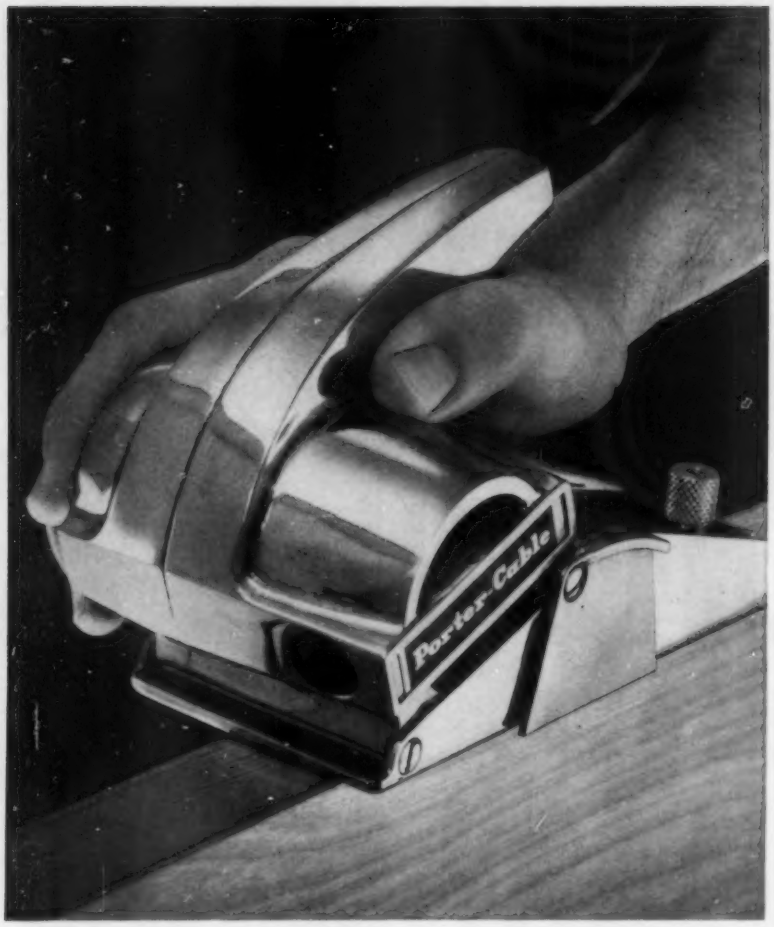
USS United States Steel

TRADEMARK



WORLD'S FIRST AND ONLY POWER BLOCK PLANE!

NEW FROM PORTER-CABLE...
NO OTHER PLANE DOES SO MUCH, SO WELL

Planes broad surfaces . . . planes any edge from 2" dressed stock to cupboard doors. Bevels and rabbets, too. A profitable tool, for production line, or plant maintenance.

Model 167 Power Block Plane: Compact, lightweight, fits in palm of one hand. Powerful heavy-duty motor and construction. 21,000-RPM big-capacity steel cutter. Positive belt drive. Bearings grease-sealed for life. Fingertip switch. Plus many more outstanding features. Write for folder and name of your nearest dealer.

PORTER-CABLE MACHINE COMPANY
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Porter-Cable
Quality Power Products

Circle 667 on postcard, page 33

VALVES, TRAPS, PIPING, FITTINGS

Precise Control—Technical information on Series 600 and other actuators in Bulletin 1236. The Annin Co.
Circle 278 on Post Card

Butterfly Valves — Bulletin 590X describes advantages of these resilient seated valves. W. S. Rockwell Co.
Circle 279 on Post Card

Pinch Valves, Systems — Massco-Grisby pinch valves are discussed in Catalog 609, all types. Mine and Smelter Supply Co.
Circle 280 on Post Card

For Medium Loads — Bulletin T-1743B on steam trap-strainer-blow down valve. Yarnall-Waring Co.
Circle 281 on Post Card

Valves, Fittings—Folder SWC-1 describes weld couplets; Catalog F-10 covers valves, fittings, flanges, unions. Henry Vogt Machine Co.
Circle 282 on Post Card

Low Cost Water Pipe—Booklet gives details on Transite industrial water pipe. Johns-Manville.
Circle 283 on Post Card

DUST CONTROL

Heavy Duty Collectors—Folder on Dustkop collectors. Aget Mfg. Co.
Circle 284 on Post Card

Efficient Dust Filter—Model K Aeroturn brochure on filter for sub-micron particles. Koppers Co., Inc.
Circle 285 on Post Card

Mechanical Dust Collector—Literature tells how Multiclone units trap more dust. Western Precipitation.
Circle 287 on Post Card

OTHER EQUIPMENT

Trouble-free Filtration—Bulletin 200 describes Staynew filters. Dollinger Corp.
Circle 289 on Post Card

Constant Efficiency—Bulletin 1260 lists advantages of "Powermaster" boiler. Orr & Sembower, Inc.
Circle 290 on Post Card

Air "Works Wonders"—Use of pneumatics in new ways is detailed in "Application Ideas". Gast Mfg. Corp.
Circle 291 on Post Card

To Combat Corrosion—"Engineering Properties of Nickel Cast Iron" gives full data. The International Nickel Co., Inc.
Circle 295 on Post Card

Flexible Tubing — Catalog detailing tubing resistant to crushing, abrasion, heat, chemicals. Pennsylvania Flexible Metallic Tubing Co., Inc.
Circle 296 on Post Card

To Stop Corrosion—Bulletin describes Spunline process for pipelines. Pipe Linings Inc.
Circle 297 on Post Card

ONE OF A SERIES OF CHATS ABOUT THE CONSERVATION AND CONTROL OF HEAT

SARCO TOPICS

STEAM CONSUMPTION WAS ERRATIC AT THE SHERATON-ATLANTIC

This is a documented steam story, and if you have the *least* interest in reduction of steam costs you'll read on. The events took place in the laundry and dry cleaning department of the Sheraton-Atlantic Hotel in New York, which purchases district steam; but they could have happened in *any* steam using establishment — including your plant.

This documentary is concerned with money — (their steam bills for laundry and dry-cleaning were tremendous) and how the Sheraton cut the bill $8500 in one year. That's giving away the climax, but not the plot. To begin with, the Sheraton engineering department kept a daily log which revealed excessive steam costs and startling discrepancies. For example, on one day, 44,000 lbs. of district steam were metered and 20,300 pieces finished. On another day, 38,000 lbs. of steam were metered and 23,300 pieces finished. Clue: This ratio was obviously cockeyed!

To relieve your suspense, we can tell you that the Sheraton removed competitive bucket traps and installed around fifty Sarco Thermo-Dynamic Steam Traps, Type TD-50, on the discharge side of each piece of steam heated equipment, and on drips on supply mains between meters and equipment, as recommended by Sarco. The results were dramatic. (Strong men didn't weep, but they did clap their hands a bit.) In the pre-Sarco December, 868,000 lbs. of steam were purchased for $1725. In the post-Sarco December, only 532,000 lbs. of steam were purchased, for $1025. And the volume of work had increased!

There are no crystal gazers on the Sarco staff; lots of competent engineers, though. These steam detectives find inefficient steam trapping at the bottom of countless high cost mysteries. Sad part of it is, the high cost of steam is only part of the story. Inefficiency in trapping can create other costly problems, too.

We talk a lot about our Thermo-Dynamic trap, don't we? So do other people. In fact we're quite used to grateful cheers of appreciation. Why don't you get the full story, by asking for it? Phone, telegraph, mail—choose your favorite medium of communication.

SARCOTROL! OUR WORD FOR SOMETHING SPECIAL IN TEMPERATURE CONTROL

It may be just what you've been looking for. We don't know. It's rather unusual. We know what it can *do*, but we still don't know everyone who needs it, even though we've been selling Sarcotrol successfully for many years to the plastic fabricating industry. New people we never heard of keep popping up saying it's just what they've needed.

When we designed Sarcotrol we planned it for specific use as a heating and cooling unit for injection molds, cylinders, rolls and drums. What surprises us is that so many different kinds of other equipment are evidently now in search of just such a control, from Banbury mixers to electric coffee pot testers.

The Sarcotrol is a portable, automatic temperature control system utilizing closed recirculation of the heat transfer fluid, to insure even temperatures throughout the equipment being heated and/or cooled. Here's the operating principle. Btu's are supplied to or removed from the rapidly moving high-pressure, high temperature fluid; the variations between delivery and return temperatures being held to a very narrow segment of the Sarcotrol's wide temperature adjustment range. A broad range of flow rates is available to handle widely varying heating and cooling loads, while maintaining tight control of temperatures across the equipment. The basic control mechanism is our own electric indicating controller. Four

standard, fully adjustable, working temperature ranges, cover all heating or cooling requirements between 0° and 300°F. (Keep reading . . . you can always go back for details.) On start-up, full heater capacity is available, and when circulating water approaches control point, heat input is automatically reduced for closer control. Temperature control instruments are automatically compensated for ambient temperature variations.

Heard enough? If not, you must feel a responsive chord vibrating, so write for details. There's literature available which contains much more information than we can give you in this chat.

OUR NEW PUBLICATION IS PRACTICAL—PLUS

SARCOSCOPE is our new house magazine into which we pour what we hope will be a useful mixture of ideas, case histories, tips, facts, news, and sense — both common and uncommon. If you are not receiving

it, we'll be happy to send future issues to you. Just send your name and address. Sarco publishes it as a service to people interested in the conservation and control of heat. We try to keep it down-to-earth, practical and useful.

SO YOU THINK YOUR PROBLEM'S UNIQUE?

Lots of hot water and steam is being wasted these days, in lots of ways. If your eyes glaze as you watch your steam bills mount or shut down your equipment for maintenance, you probably wonder what you did to deserve such problems. If it's any consolation, it's very unlikely that you are alone in your misery. The chances are excellent we have solved just such a problem already for plants similar to yours. Try us. Describe your problem in a letter. We'll probably be able to send you a set of Sarco Case Histories, describing how other plants were able to conquer problems like yours.

5897

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SARCO COMPANY, INC.
635 MADISON AVENUE, NEW YORK 22, N. Y.
PLANT: BETHLEHEM, PA.

STEAM TRAPS • TEMPERATURE CONTROLLERS
STRAINERS • HEATING SPECIALTIES

Circle 668 on postcard, page 33

DATA FILE OF LITERATURE FOR THE PLANT ENGINEER'S LIBRARY

STANDARD CATALOGS, bulletins and handbooks are described here to help plant engineers maintain a permanent data file. To order this free literature, use Reader Service Cards provided for you on pages 33-34.

DUST, FUME CONTROL

Cabinet Dust Collectors

Self-contained cloth-filter type dust collectors are described in 6-pp Bulletin 359. Torit Mfg. Co.

For a copy, circle 301 on Post Card

For Dust Collection

Series 700 bulletins provide application suggestions and specifications on Dustkop equipment for a wide range of dust problems. Aget Mfg. Co.

For a copy, circle 302 on Post Card

Dust Collection, Recovery

Collecting, recovery and classifying equipment is presented in this product bulletin. Covers electric precipitators, mechanical collectors, bag collectors, classifiers, fans. Buell Engineering Co., Inc.

For a copy, circle 303 on Post Card

Dust Collection, Recovery

Product data on dust collection, precipitation and gas scrubbing equipment covers electrical precipitators, mechanical dust collectors, others. Western Precipitation Corp.

For a copy, circle 305 on Post Card

HEATERS, HEATING

Gas-Fired Unit Heaters

Operating principles, selection factors, applications and specifications for propeller, duct, blower and heavy-duty type heaters are outlined in this 16-pp bulletin. Janitrol Heating and Air Conditioning Div.

For a copy, circle 306 on Post Card

Industrial Heaters

Described in this 12-pp bulletin are heaters for unit or central application. Typical installations are pictured, construction and operating features shown, and engineering data included. Lennox Industries Inc.

For a copy, circle 307 on Post Card

For Heating Problem Spots

Use of electric heaters for lobbies, reception rooms, washrooms, garages, stockrooms, and for heating entire areas is described in 12-pp Booklet F-1615. Typical installations are illustrated. Edwin L. Wiegand Co.

For a copy, circle 308 on Post Card

Direct Fired Heaters

Specifications, dimensions and engineering data on unit heaters for any fuel application are presented in 6-pp bulletin. Jackson & Church Div.

For a copy, circle 309 on Post Card

Heater Test Code

Presented in 22-pp Bulletin 20 is a revised code for testing propeller-type steam unit heaters. Establishes uniform methods for tests on heaters using dry steam as heating medium and serves as a standard for developing performance ratings. Air Moving & Conditioning Ass'n, Inc.

For a copy, circle 310 on Post Card

On Tank Heaters

Sixteen-pp Bulletin TH-160, on Hydro-Flo tank heaters for heating water with steam, describes water features and operating procedure. Bell & Gossett Co.

For a copy, circle 311 on Post Card

FILTERING

Compressed Air Filter

Operating principles of a filter for removing dirt, oil and water are detailed on cutaway view. King Engineering Corp.

For a copy, circle 312 on Post Card

Filters for Industry

Illustrated and described in this product bulletin are filters for many applications, including liquid filters, intake filters, pipe line filters, others. The Dollinger Corp.

For a copy, circle 313 on Post Card

PUMPS, COMPRESSORS

Motor Mounted Pumps

Compact, fhp-motor-mounted pumps in capacities of ½ to 3 gpm are described, with specifications and performance data, in Data Sheet SP-509. Viking Pump Co.

For a copy, circle 314 on Post Card

Condensation Pumps

Eight-pp Bulletin 1403 contains technical data and capacity tables on condensation pumps for low and medium pressure-heating systems and steam-processing. Dunham-Bush, Inc.

For a copy, circle 315 on Post Card

Improved Metering Pump

Introduced in this 12-pp catalog is Series 200 metering pump, an electrically driven pump of positive displacement, reciprocating, plunger type. Design and operating features. Wallace & Tiernan Inc.

For a copy, circle 316 on Post Card

Vertical Pump for Industry

Cutaway view showing design and mechanical features of vertical pumps for application in sump pumps, cooling tower service, raw water supply, circulating pumps, other services provided in Bulletin 1030. Johnston Pump Co.

For a copy, circle 317 on Post Card

Water-Cooled Compressors

Described in Bulletin LA-1 are the LA and LB water-cooled compressors, the LA for operation at normal plant pressures and the LB for high pressure use. Gardner-Denver Co.

For a copy, circle 318 on Post Card

Rotary Air Products

Performance curves and engineering tables along with data on features and advantages of rotary air products, including air motors, air compressors, vucuum pumps given in 12-pp Catalog 660. Gast Mfg. Corp.

For a copy, circle 319 on Post Card

Semi-Radial Air Compressors

Design and construction details on semi-radial air compressors and their advantages are presented in 24-pp Bulletin A-72. Joy Mfg. Co.

For a copy, circle 320 on Post Card

Packaged Air Compressors

Air-cooled packaged air compressors for industrial applications are described in 6-pp Bulletin 203. Clark Bros. Co., Div., Dresser Industries.

For a copy, circle 321 on Post Card

Compressed Air Fundamentals

Sixteen-pp Form 1548A on selecting a small packaged air compressor discusses compressed air and how it is compressed, single- and two-stage compressors, piston displacement, control used. Ingersoll-Rand Co.

For a copy, circle 322 on Post Card

Feather Valve Compressors

Installation advantages, operation and maintenance details for YC and DYC feather valve compressors, from 75 to 350 hp, are outlined in 32-pp Bulletin 3620-Bl. Worthington Corp.

For a copy, circle 323 on Post Card

PACKINGS, SEALS

Compression Packings

Featured in this 22-pp catalog are compression packings, including sheet and rod seal types, packing materials, and list of packings for various services. E. F. Houghton & Co.

For a copy, circle 325 on Post Card

Piston Packing Data

Sixteen-pp Bulletin 5903 presents engineering data on Darcova Pumpcups for packing pistons of air and hydraulic cylinders, and reciprocating pumps. Darling Valve & Mfg. Co.

For a copy, circle 326 on Post Card

Industrial Mechanical Seals

Performance and design features of Mechanipak PK mechanical seals for a variety of operating conditions are detailed in 8-pp Bulletin AD-150. Garlock, Inc.

For a copy, circle 327 on Post Card

Here is the tool that permanently anchors a 2 x 4 to concrete with less than ten taps of a hammer. Without drilling or plugging.

It's called Shure-Set®

It does plenty of other fastening jobs too. Junction boxes, conduit clips, gutters. Heaters, signs, Wiremold. Using Shure-Set you can attach almost anything to concrete and other masonry materials. And you do it rapidly.

How is it possible? A special steel fastener is inserted at one end of Shure-Set, your hammer blow is directed against the large movable anvil at the other end. The easy-to-hit anvil concentrates the force of the hammer blow onto the fastener, but within the confines of Shure-Set's precision bore. The fastener can't waver or skew off. Every swing of the hammer drives it straight and true into the concrete. (Note: powder charges are *not* used in this tool.)

And Shure-Set's austempered steel fasteners *never* bend or break. Austempering has given them the ideal metallurgical properties for penetrating hard construction materials (it's the same heat treatment we give our *powder-driven* fasteners). These steel drive pins ("nails") and threaded studs make a strong, permanent, compressive bond to concrete. For a light-duty fastening, you won't find anything stronger.

And for the few cases—such as tile or glazed brick—where "tap-and-turn" work is unavoidable, a drill holder attachment is provided for converting Shure-Set into a superior masonry drill. Still another attachment fits it for use in fastening sheet metal to sheet metal.

Shure-Set is on its way to becoming a tool box standard because of its immense versatility. And because it pays for itself by saving time. Usually on the very first job. It also saves a lot of (put your own price on it) perspiration.

To find out where to buy Shure-Set nearest you, look under TOOLS in the Yellow Pages of your directory.

294-F Winchester Ave., New Haven 4, Conn. WINCHESTER-WESTERN DIVISION Olin

Circle 669 on postcard, page 33

DATA FILE

(Begins on page 256)

Mechanical Packings

Featured in 24-pp Catalog 60 are multi-purpose Bel-Vee V-ring packings, criss-cross braid packing, twisted foil packings, for oil and distillate temperatures to 1000 F. The Belmont Packing & Rubber Co.

For a copy, circle 328 on Post Card

BOILERS, GENERATORS

Self-Contained Steam Generators

Descriptive details and table of steam generator specifications for oil-fired, gasoline engine drive units included in this data sheet by Clayton Mfg. Co.

For a copy, circle 329 on Post Card

Packaged, Automatic Units

Bulletin 1275 describes features and advantages of a positive flow packaged automatic boiler with side located furnace. Sizes, ratings are tabulated. Orr & Sembower, Inc.

For a copy, circle 330 on Post Card

Efficient Wet-Back Boiler

Bulletin B-3456 describes design and performance features of a three-pass, package fire tube unit adapted for gas, oil and gas-oil combinations. The Titusville Iron Works Co.

For a copy, circle 331 on Post Card

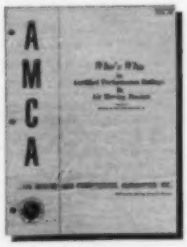
Who's Who

The first edition of "Who's Who in Certified Performance Ratings" is now available to users and specifiers of air moving equipment. This new publication of the Air Moving and Conditioning Association meets the recognized need for an official directory of manufacturers and products licensed by AMCA to use the Certified Ratings Seal.

in Certified

The 54-page directory contains essential product identification data on all air moving devices which have been tested and rated for performance in accordance with the rigid requirements of the AMCA Certified Ratings Program. Revised issues will be published periodically.

Copies of Bulletin 261A, "Who's Who in Certified Performance Ratings" are available from: Air Moving and Conditioning Association, Inc., 2159 Guardian Building, Detroit 26, Michigan.



Ratings?

Circle 670 on postcard, page 33

Packaged Steam Generator

Design and construction details and tables of capacities, dimensions and weights on a compact, portable shop-assembled water tube boiler with integrated firing equipment and controls are presented in 10-pp Bulletin PSG-3. Henry Vogt Machine Co.

For a copy, circle 332 on Post Card

VALVES, TRAPS, PIPING AND FITTINGS

Valve Buyers' Guide

Information on bronze, steel and iron valves and valves of corrosion-resistant metals and alloys is presented in 24-pp Form 186. Covers angle, check, gate, globe, liquid level types, also lubricated plug valves, needle valves. The Wm. Powell Co.

For a copy, circle 333 on Post Card

Stainless Steel Valves

Catalog 59SS, 32 pp, on stainless steel valves, illustrates design and construction features. Details advantages in withstanding corrosive atmospheres. Jenkins Bros.

For a copy, circle 334 on Post Card

Corrosion Resistant Valves

Presented in 16-pp Bulletin 7 are corrosion resistant gate, globe, angle, Y, check valves, and sampling valves and accessories. Lists alloy materials with chemical composition ranges. Alloy Steel Products Co.

For a copy, circle 335 on Post Card

Improved Butterfly Valves

Resilient-seated butterfly valves for applications where positive tight closure counts are illustrated in Bulletin 590X. W. S. Rockwell Co.

For a copy, circle 336 on Post Card

Improved Control Valves

Bulletin 300 describes three- and four-way valves for rugged control applications. Operating principles and design features are illustrated. W. H. Nicholson and Co.

For a copy, circle 337 on Post Card

Pinch Valves

Construction features of Massco-Grigsby pinch valves are explained and illustrated in 14-pp Catalog 609. Provides sleeve service recommendations and specifications for manual, motorized, hydraulic types. Mine and Smelter Supply Co.

For a copy, circle 338 on Post Card

Direct Acting Solenoid Valves

Specifications and flow curves for air and water are included in this 8-pp bulletin on solenoid valves for use with a variety of media. Marsh Instrument Co.

For a copy, circle 339 on Post Card

Steam Traps, Regulators

This 12-pp condensed catalog contains technical and capacity data on steam traps, temperature regulators and heating specialties. Cutaway views included. Sarco Co., Inc.

For a copy, circle 340 on Post Card

Read this . . . Order this . . . Install this . . .

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Here's the Handbook *that tells you exactly what to do to cut costs with pre-engineered HANDIDRIVE conveyors. Send for your free personal copy now. Just fill in the coupon, attach to your letterhead and mail. Do it today!*

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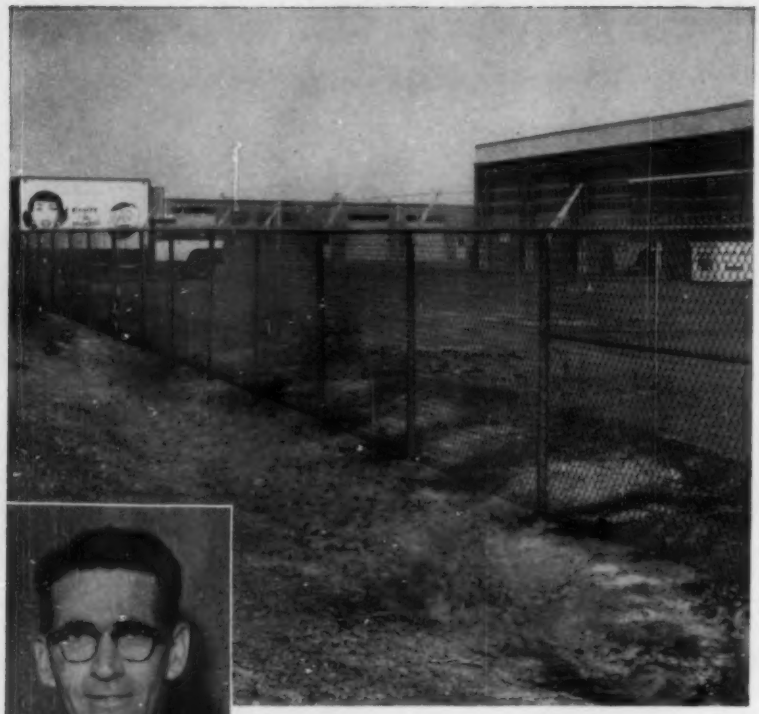
Circle 671 on postcard, page 33



says W. L. Hause, Assistant to the President, Pepsi-Cola Bottling Co., Inc., Pennsauken, N. J.

"...makes a safe outdoor 'garage' for our 45 trucks..."

"Our plant yard is a very necessary part of our operation, so our Anchor Fence must satisfy a number of needs. And it does. Keeps out trespassers of all ages, makes a safe outdoor 'garage' for our 45 trucks, permits all-weather storage for a great amount of other equipment, too. Anchor Fence has also proved ideal for controlling traffic on our property—not only in and out of our plant yard, but around it, as well. As for maintenance—our first Anchor Fence was installed in 1957, and it's still repair-free."

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Circle 672 on postcard, page 33

DATA FILE

(Begins on page 256)

Steam Trap Fundamentals
Facts on drainage and steam trap operation are presented in this 16-pp primer. Data on trap maintenance included. Barnes & Jones, Inc.
For a copy, circle 341 on Post Card

Manual on Steam Traps
Catalog K, 48 pp, on steam traps, provides information on open flat and thermostatic types, pipe strainers. Discusses fundamentals of steam trapping, selection and installation. Armstrong Machine Works.
For a copy, circle 342 on Post Card

Impulse Steam Traps
Operation details and advantages of impulse steam traps are described in Bulletin T-1743. Data on pressures and temperatures, materials, capacities given. Yarnall-Waring Co.
For a copy, circle 343 on Post Card

Trap Strainer Applications
Bulletin 601, 8 pp, gives case histories of trap strainer applications. Covers size, straining media, materials of construction, housing, screens. Multi-Metal Wire Cloth Co., Inc.
For a copy, circle 344 on Post Card

Unions, Valves, Fittings
Ring-bound Catalog U-601 provides detailed literature on unions, valves and fittings of forged steel. Lists popular unions with their technical ratings, details of construction. Clayton Mark & Co.
For a copy, circle 345 on Post Card

Plumbing, Heating Specialties
Protection and control specialties are illustrated in 12 pp Condensed Catalog C-60. Describes automatic temperature and pressure relief valves, temperature relief valves, gas shutoff valves, others. Watts Regulator Co.
For a copy, circle 346 on Post Card

Swivel Joints
Detailed information on swivel joints for many applications is presented in 24-pp Bulletin G-5. Basic types and applications are covered and specifications and dimensions included. Chiksan Co.
For a copy, circle 347 on Post Card

Rigid Plastic Pipe
Bulletin HT-100, 6 pp, describes a rigid plastic pipe for high temperatures, pressures. Pictures typical applications and provides installation information, working pressures, support spacing recommendations, properties. Carlon Products Corp.
For a copy, circle 348 on Post Card

Plastic Pipe Working Data
Characteristics and advantages of plastic pipe are detailed in Bulletin TR-273A. Covers physical properties, rated working pressures, weights, Johns-Manville Corp.
For a copy, circle 349 on Post Card

Piping Products

Use of company's coupling, fittings, and other piping products is discussed in 8-pp Form 259. Contains installation instructions, specifications, illustrations of uses. Dresser Mfg. Div., Dresser Industries, Inc.

For a copy, circle 350 on Post Card

INSULATION

For Hot or Cold Piping

Performance benefits of Stay-Dry fire-retardant pipe insulation of Foamglas are detailed in this product bulletin, along with sizes and thicknesses, specifications, and physical properties. Pittsburgh Corning Corp.

For a copy, circle 352 on Post Card

Calcium Silicate Insulation

Pipe and block insulation of calcium silicate is featured in Form 6472. Lists heat transmission data, physical and thermal characteristics. Philip Carey Mfg. Co.

For a copy, circle 353 on Post Card

Why Fiber Glass Insulation

Applications and advantages of fiber glass as insulation are described in Product Bulletin F-100 with dimensional data included. Pittsburgh Plate Glass Co.

For a copy, circle 354 on Post Card

Snap-On Pipe Insulation

Characteristics and advantages of one piece molded pipe insulation of glass fibers are detailed in this 10-pp bulletin. Specifications for plumbing and heating, insulation of valves and fittings, dual temperature, piping, etc. included. Gustin-Bacon Mfg. Co.

For a copy, circle 355 on Post Card

CONSTRUCTION

For Longer Lasting Concrete

Products for improving concrete and mortar are described in this 12-pp industrial catalog. Covers iron-armored concrete floor, non-shrink, and pre-mixed grout and mortar. The Master Builders Co.

For a copy, circle 356 on Post Card

Structural Clay Products

Descriptive information and construction details on structural clay building materials are given in 24-pp Catalog S-60. Characteristics and advantages of facing tile, bricks, other products, are detailed. Natco Corp.

For a copy, circle 357 on Post Card

Cold Storage Doors

Advantages of Electroglide electric horizontal sliding doors for cooler and freezer operation are detailed in this 6-pp bulletin. Includes table of sizes, installation data. Jamison Cold Storage Door Co.

For a copy, circle 358 on Post Card

Acoustical Ceiling Panels

Noise reduction features of these decorative ceiling panels are stressed in bulletin. Keasbey & Mattison.

For a copy, circle 359 on Post Card

Non-Slip Steel Flooring

Algrip, an abrasive rolled steel floor flate, described as non-slip even on steep inclines, is the subject of 8-pp Booklet AL-29. Alan Wood Steel Co.

For a copy, circle 360 on Post Card

Screw Fastening of Aluminum

This 48-pp technical handbook covers standard and special fasteners and fastening systems used to join aluminum assemblies. Includes list of manufacturers of screw fasteners. Reynolds Metals Co.

For a copy, circle 361 on Post Card

Steel Hardware Products

Catalog HP-322 contains 20 pp of detailed information on wire screening, hardware cloth, general purpose welded wire fabric, door and gate springs, merchant and stone wire. The Colorado Fuel and Iron Corp.

For a copy, circle 362 on Post Card

STORAGE, SHOP EQUIPMENT

Vertical Storage System

Catalog TRC-102 illustrates the Trak-Rak system of vertical storage and handling of sheet, coils, bars, drums and palletized material. Gives cost data. Chicago Tramrail Corp.

For a copy, circle 363 on Post Card

Steel Storage Equipment

Reference Manual 487 contains 64 pp of data on shelving, bins, doors, slotted angle, drawer units, lockers, benches, grating, counters, others. Assembly details and dimensions provided. Equipto.

For a copy, circle 364 on Post Card

Steel Equipment Selection

Catalog 100 K contains 100 pp of detailed information on steel cabinets, folding chairs, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, bins. Lyon Metal Products, Inc.

For a copy, circle 365 on Post Card

MATERIALS HANDLING

Integrated Conveyor System

Presented in 22-pp Bulletin 112 is a conveyor system with "off-the-shelf" units that fit together as integrated components. Describes three plans for selecting the pre-engineered, prefabricated components to suit plant needs. Standard Conveyor Co.

For a copy, circle 366 on Post Card

Economy of Trolley Conveyors

What a trolley conveyor can do to reduce manufacturing and handling costs—and how to select the right one for any requirement—are topics considered in 58-pp Book 2730. Includes examples of typical installations, as well as information on system design. Link-Belt Co.

For a copy, circle 367 on Post Card

Continuous Flow Systems

Illustrated and described in 32-pp Catalog 860 are typical installations

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NEW ALL-ALUMINUM CHAIN LINK FENCE

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ANCHOR FENCE made of REYNOLDS ALUMINUM

Watch Reynolds TV show: "HARRIGAN AND SON," Friday evenings, ABC-TV Network.

Circle 673 on postcard, page 33

DATA FILE

(Begins on page 256)

of continuous flow materials handling systems. Covers roller, wheel and belt conveyors, chain conveyors, overhead trolley conveyors, elevating conveyors. Mathews Conveyer Co.

For a copy, circle 368 on Post Card

Hoists for Industry

Described in 8-pp Catalog 601 are lever, electric, air, hand chain hoists and trolleys. Rated capacities are tabulated. Duff-Norton Co.

For a copy, circle 369 on Post Card

Load Handling Equipment

Twenty-pp Bulletin 15025 describes portable electric hoists, I-beam trolleys, differential chain hoist, trolley hoists, lever-operated hoists, electric hoists, driven trolleys, air hoists, jib assemblies and bridge cranes. Detailed specifications given. Manning, Maxwell & Moore, Inc.

For a copy, circle 370 on Post Card

Electrical Conductor System

Bulletin 2016 describes a conductor system for providing electrification of maximum safety and long life on overhead handling equipment. Installation details illustrated. Cleveland Tramrail Div. The Cleveland Crane & Engineering Co.

For a copy, circle 371 on Post Card

Crane Control Selection

Bulletin 9100 contains 20 pp of application information on a crane control for hoist, bridge and trolley service. Performance curves, schematic diagrams, dimensions provided. The Clark Controller Co.

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Vertical Transportation

Selection of vertical transportation for every traffic-moving job is detailed in 32-pp Bulletin A-382. Various elevators and escalators are described. Otis Elevator Co.

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Why Self-Dumping Hoppers

Cost-saving advantages of self-dumping steel hoppers for bulk handling are detailed in Bulletin 265, along with typical handling applications. Reura Iron Works, Inc.

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Sheet, Coil Lifters, All Types

Detailed information on sheet and coil handling lifters and related equipment is presented in 24-pp Bulletin SL-32. Applications are pictured. Cullen-Friestedt Co.

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PROCESSING EQUIPMENT—

For Industrial Processing

Illustrated and described in this 20-pp bulletin are ovens, parts washers and phosphatizing machinery, dust and fume collectors and spray booths. Includes dimensional data. Gallagher-Kaiser Corp.

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Industrial Finishing Systems

Catalog A-660 discusses spray, dip or flow coatings; cleaning, pickling, rust-proofing, hydro-filter spray booths; dip and flow coaters; drying and baking ovens; hydro-foam dust collectors. The R. C. Mahon Co.

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For Controlled Feeding

Weighing, batching and proportioning systems for controlled weights and rates of material flow in industry are described in 48-pp Catalog 941. Includes data on constant weight feeders, rotary bin check valves. The Jeffrey Mfg. Co.

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Flame Spraying Processes

Basic engineering and application data on flame-sprayed coatings of metals, ceramics, carbides and other high-melting-point materials are presented in 16-pp Bulletin 136B. Includes charts on specific characteristics. Metco, Inc.

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TOOLS, WELDING AND MACHINE SHOP—

Air Tools at Work

The growing use of air tools in building and industry is covered in 8-pp

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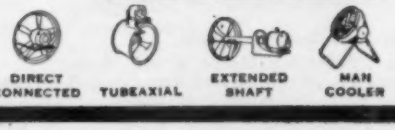

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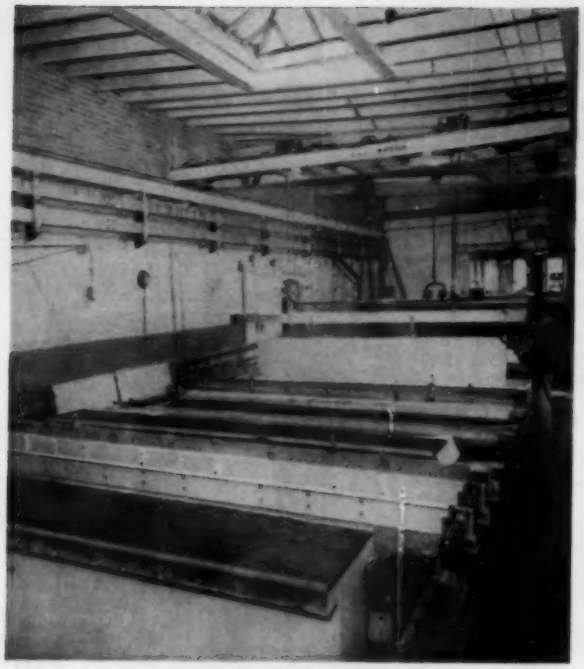

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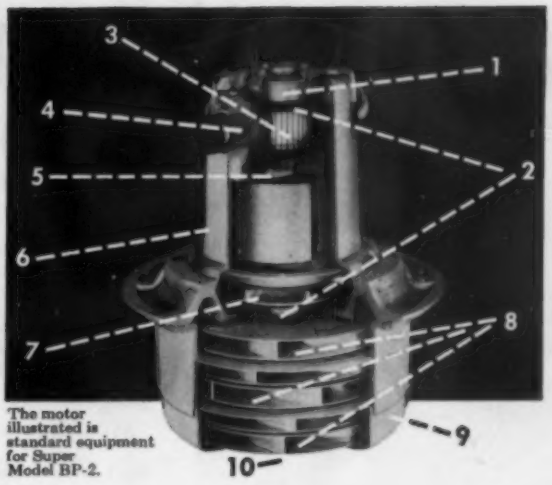

The motor illustrated is standard equipment for Super Model BP-2.

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Circle 676 on postcard, page 33

DATA FILE

(Begins on page 256)

Bulletin AT-116B. Selection data and a trouble chart are included. Le Roi Div., Westinghouse Air Brake Co.

For a copy, circle 381 on Post Card

Guide to Power Tools

Presented in this 68-pp catalog are electric and pneumatic tools for production, maintenance, construction, wood and metal working. Features worm drive and high speed saws; reciprocating saws; jig saws; hammers; planes; routers; sanders; drills; drivers; wrenches. Skil Corp.

For a copy, circle 382 on Post Card

Electric Tool Guide

Portable electric tools and kits, including saws, sanders, drills, planes, routers, shapers, hammers, grinders and combination tools are illustrated in 30-pp Catalog 108. Prices given. Porter-Cable Machine Co.

For a copy, circle 383 on Post Card

Specialty Tools for Industry

Geared threaders, tubing cutters, flaring tools, chain wrenches and spiral reamers are among the tools illustrated and described in a series of publications, Catalog Sheets 60-A through 60-D. The Ridge Tool Co.

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Wrenches, Hand Tools

Industrial Catalog 58-I, 156 pp, presents tools for production line, maintenance and product servicing. Loaded with pictures and facts, book describes over 4000 tools—including chests and roll cabs, wrenches and sockets. Snap-on Tools Corp.

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Fastening Tool

Illustrated in Catalog Form B-141 is the Duo-Jobmaster for tough fastening jobs into steel or concrete. Features, advantages detailed. Ramset Div., Olin Mathieson Chemical Corp.

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For Vibration Control

A vinyl cork, sisal machine pad and an adjustable machine mount for reducing transmitted vibration are described in this bulletin. Clark-Cutler-McDermott Co.

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SAFETY, SANITATION

Fire-Resistant Fluids

This series of specification sheets on fire-resistant fluids covers synthetics, oil-in-water and water-in-oil emulsions, glycols. Mobil Oil Co., Inc.

For a copy, circle 388 on Post Card

Industrial Skin Cleansers

This bulletin describes three industrial soaps: a fine, granulated cleanser, a heavy-duty type, and an extra-fine granulated type. Sugar Beet Products Co.

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MAINTENANCE

Long Run Paint Economy

Paint selection factors are detailed in the sixth edition of "Engineered Color," 20 pp. Covers proper use of paint and color, requirements of various surfaces, color and the safety program. Describes interior and exterior primers, finishers, varnishes, floor sealers. Includes color chips. Barreled Sunlight Paint Co.

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Protective Coatings

Corrosion resistant coatings, treatments for floors, and coatings and waterproofing for masonry are described in 72-pp Form 990. Presents information on maintenance products for interiors, door coatings, exteriors, roofs. Truscon Laboratories Div., Devoe & Raynolds Co., Inc.

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Rust, Corrosion Control

This 32-pp comprehensive treatise (Form 259) on protective coatings shows actual color standards of company's primers and top coating. Covers water-resistant, heat-resistance floor coatings, heavy-duty chemical resistant coatings, galvanized metal coatings, wire fence roller coatings and quick-dry types. Contains 110 color chips. Rust-Oleum Corp.

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Epoxy-Coal Tar Coatings

Data on epoxy-coal tar coatings for protection of metal surfaces, equipment, ground pipes and metal and concrete structures is given in Bulletin 803, along with a chart listing Carbomastic coating systems. Carboline Co.

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Sanitary Wall Coating

Ceramic-like coating for use on cement, cement block, brick, plaster, wood and composition is described in this product bulletin covering properties, advantages and application methods. The Master Mechanics Co.

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Aggregate Resurfacing Material

Strength, abrasion resistance and other advantages of Chem-Top aggregate resurfacing material for all types of floors are detailed in this product bulletin. The Garland Co.

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Sulfamic Acid Cleaners

Scale dissolution rates for sulfamic cleaning, plus a diagram showing simple equipment cleaning hookups are presented in this 8-pp product bulletin. E. I. du Pont de Nemours & Co.

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Drain, Supply Line Cleaner

Bulletin 658Du describes a drain and supply line cleaner featuring a lightweight alloy housing, giving advantages. Kollmann Mfg. Co.

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Heavy Duty Vacuum Cleaners

Bulletin 34, 8 pp, gives specifications, construction features of heavy-duty

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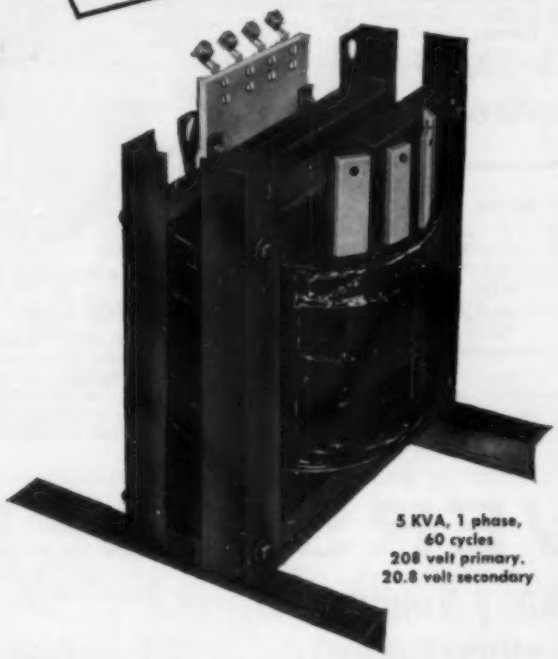

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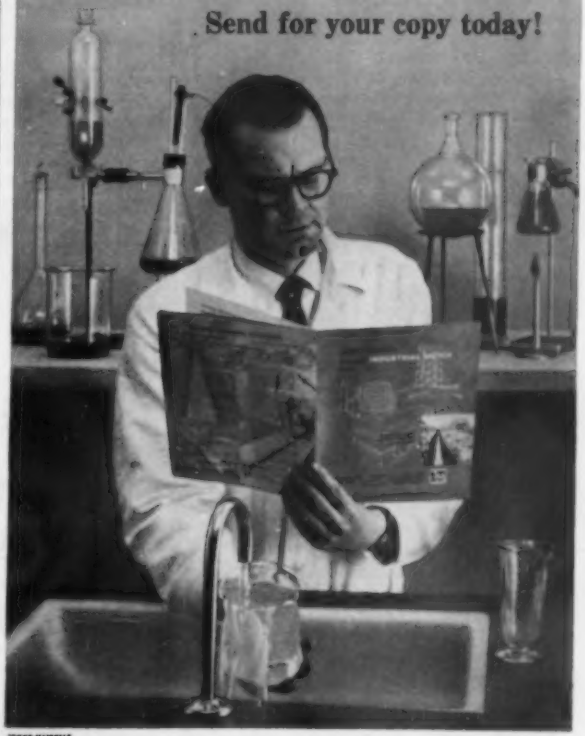

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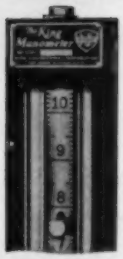

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DATA FILE

(Begins on page 256)

vacuum cleaners, also a furnace cleaner. The Black & Decker Mfg. Co.

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Vacuum Cleaning Equipment
Suction cleaning equipment for wet and dry dust and dirt removal is featured in a series of product bulletins. The National Super Service Co.

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Industrial Vacuum Cleaning
Twelve-pp Bulletin 115 B describes both stationary and portable vacuum cleaning equipment. Recent improvements in collection and dumping methods are covered. Spencer Turbine Co.

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LUBRICATION

Lubrication of Gear Drives
Pamphlet tells how E.P. lubricants insure trouble-free reduction gear drive performance and lower maintenance costs. Gulf Oil Corp.

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Selection, Use of Lubricants
Characteristics, advantages of specialized fluid and grease type lubricants are given in 32-pp Data Book 59-2. Covers control of friction, use of grease type lubes, proper application, recommendations for various operating conditions. Lubri-plate Div., Fiske Brothers Refining Co.

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Organized Lubrication Benefits
Major cost control factors of organized lubrication are told in this 24-pp bulletin. Covers cost control opportunities, assigning responsibilities. Texaco, Inc.

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ROPE, SLINGS, CHAINS

Sling Chain Handbook
Illustrated Data Book 100, 32 pp, presents "how to do it" information on sling chains—from ordering to care, use and inspection. Covers standard, special styles. Columbus McKinnon Corp.

For a copy, circle 404 on Post Card

Rugged Roller Chain
This technical folder prescribes offset side bar roller chain for applications where operating conditions are severe. Construction details, sizes given. Atlas Chain & Mfg. Co.

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Roller Chain Application Guide
Catalog 760, 120 pp, on stock roller chain, sprockets and couplings, carries new ARSCM hp ratings. With the new higher ratings, roller chain can be used in more applications because of the greater loads transmit-

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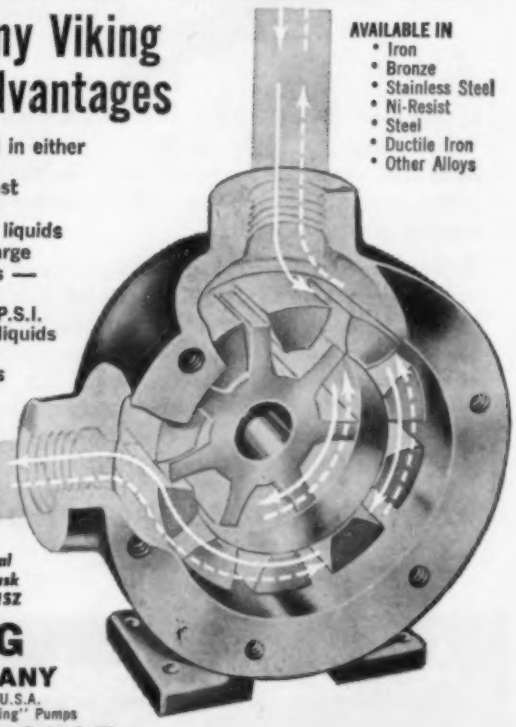

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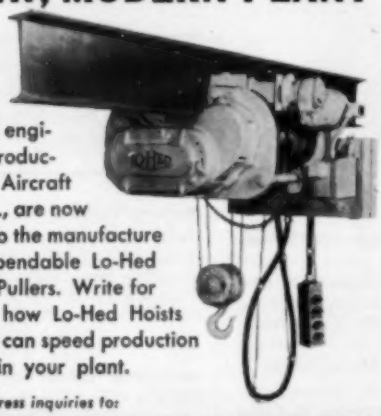

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Wiley BOOKS

MODERN PRODUCTION MANAGEMENT

By ELWOOD S. BUFFA, *University of California.* Major objective is to integrate new material from operations research, management science, and industrial engineering into an understandable but not oversimplified treatment. Quantitative methods are explained for design of processes, automated systems, plant location, and layout of facilities. *1961. 623 pages. $10.25*

PRODUCTION FORECASTING, PLANNING, AND CONTROL

Third Edition

By E. H. MAC NIECE, *Johnson & Johnson.* How forecasting, planning, and control are related to automation, data processing, quality control, accounting, etc., including the human factors involved. The book has been updated throughout and expanded by about 20%. *1961. 402 pages. $9.75*

WAREHOUSE OPERATIONS PLANNING AND MANAGEMENT

By ANDREW J. BRIGGS, *May Company.* Gives step-by-step, specific, and *practical* approaches, leading the reader directly through all stages—planning, organizing, managing, and operations. Stripped of unnecessary and confusing alternatives, it presents a sharply defined picture of what engineer and warehouse manager need and want to know. *1960. 303 pages. $8.50*

MAGNETIC CONTROL OF INDUSTRIAL MOTORS, 3 Vols.

By GERHART W. HEUMANN, *General Electric Co.* Analyzes controllers for industrial A-C and D-C motors, and gives full treatment of each motor in conjunction with its associated controllers. **Part I:** A-C Control Devices and Assemblies. *1961. Approx. 312 pages. $9.00.* **Part II:** A-C Motor Controllers. *1961. 334 pages. $9.00.* **Part III:** D-C Motor Controllers. *In Press*

THE DYNAMIC BEHAVIOR OF THERMOELECTRIC DEVICES

By PAUL E. GRAY, *Massachusetts Institute of Technology.* Deals with the dynamic behavior of thermoelectric heat pumps and generators. It is the first published report to investigate the *small-signal* dynamic behavior of thermoelectric devices. *An M.I.T. Press Research Monograph. 1960. 136 pages. $3.50*

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DATA FILE

(Begins on page 256)

ted at higher speeds. Also shown are company's new products in transmission, conveying. Catalog is available to qualified plant engineers. Diamond Chain Co., Inc.

For a copy, circle 406 on Post Card

Sling Reference Handbook

Forty-pp Form SL-3 covers more than 80 subjects on slings and fittings. Included in this revised edition is reference in formation in handy chart form on sling types, dimensions, loads. Union Wire Rope Co.

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Wire Rope Advantages

Benefits and economies of company's wire rope for all uses are detailed in this product bulletin. Type and constructions are covered, and weight charts included. Leschen Wire Rope Div., H. K. Porter Co., Inc.

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Chain Overload Warning Ring

Described in this product folder is a coupling link for use between master link and chain leg which elongates and gives visual evidence that sling is overloaded. Campbell Chain Co.

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INSTRUMENTS, CONTROLS—

Electronics for Automation

Catalog HB-5901, 64 pp, gives information on home study training courses covering such subjects as applications of industrial electron tubes, motors and motor controls, power supplies and regulation, sensing and control devices, servo-mechanism components, recording and readout devices etc. Includes details on assignments, test papers, certificates, tuition. RCA Institutes, Inc.

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Any of these bulletins, catalogs and technical booklets can be yours without cost or obligation. Use the Reader Service Cards on page 34.

Meters, Regulators, Valves

Bulletin C-5000, 28 pp, describes gas, industrial, and water meters, gas pressure regulators and valves for a wide range of services. Application tips included. Rockwell Mfg. Co.

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Industrial Limit Controls

Details on recording, indicating and non-indicating limit controls with sample specification are presented in Bulletin 501 by The Partlow Corp.

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Tank Contents Gaging

Bulletin 463A describes remote and direct reading systems, including hydrostatic, hydraulic and direct read-

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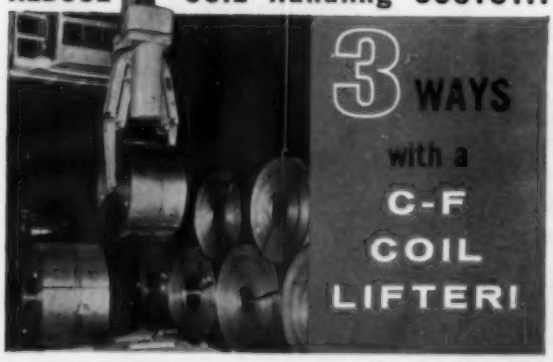


1 **SAVE MANPOWER**—only 1 man, the crane operator, is required to operate the C-F Coil Lifter above.

2 **SAVE SPACE**—you can operate a C-F Coil Lifter in a minimum of space, as little as 10" to 12", between piles, regardless of coil width.

3 **ELIMINATE DAMAGE**—the strong mechanical grip, and legs remaining vertical at all times prevent any damage to stock or material.

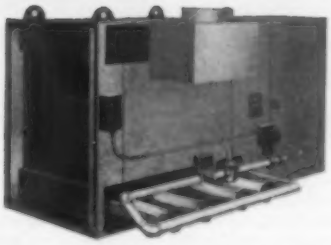
Motorized C-F Coil Lifters with Motorized Swivels as above are designed for safe, fast, efficient one man operation. They allow the crane operator to grab, lift, carry and rotate, set down and release the load precisely—in minimum space—without additional help.

WRITE NOW FOR NEW BULLETIN **SL 32.**

CULLEN-FRIESTEDT Co.
1317 S. Kilbourn Ave. • Chicago 23, Ill.

Circle 687 on postcard, page 33

J-C SUSPENDED FURNACES are engineered for EXTRA POWER



Oil-Fired Suspended
Model No. OL-350-S22,
224,000 Btuh output.

Gas-Fired Suspended
Model No. GS-24,
192,000 Btuh output.

New and practically unlimited zone-heating possibilities, plus a saving of valuable floor space and easy installation are yours with the great 23-model line of Jackson & Church Gas and Oil-Fired Suspended Heaters . . . all the way from 123,000 to 1,000,000 Btuh output. Find out about J-C's *extra* fuel economy and extra power to deliver an extra volume of air against abnormal static pressure. Update your files with current specs. Write today.

J-C AMERICA'S LARGEST AND MOST COMPLETE WARM AIR FURNACE LINE.

Direct-Fired Unit Heater, 400,000 to 4,000,000 Btuh output. Floor-mounted, suspended, inverted models. Oil, gas or dual fuel.

12 Powerated Tubular Enclosed Cabinet Models . . . 208,000 to 320,000 Btuh output. Oil, gas or dual fuel.

37 Powerated Tubular Models with separate blower cabinets . . . 400,000 to 3,800,000 Btuh output. Oil, gas, dual fuel, or stoker firing.

J-C DIVISION OF **JACKSON & CHURCH**
YORK-SHIPLEY, INC.
YORK, PENNSYLVANIA

Pioneers and Specialists in Automatic Heat. Boilers to 600 hp. Furnaces to 4,750,000 Btuh

Circle 688 on postcard, page 33

save money... keep D. C. motors and generators running in top condition (without dismantling)

with IDEAL

FLEXIBLE ABRASIVES

Clean, burnish commutators while revolving. Non-dusting, non-conductive, non-loading. Remove damaging scum, dirt, grease — impart super finish for maximum operating efficiency. Fine grain abrasive in flexible bond, won't harm copper or "chocolate" film. 6 sizes for all needs.

and IDEAL

BRUSH SEATERS

Seat carbon brushes by touching to rotating commutator at brush heel, holding brush down. Released abrasive smoothes brushes, stopping damaging sparking. Also cleans small commutators and slip rings. Self cleans, won't scratch. 11 sizes in grades for all conditions.

For over 40 years IDEAL

has produced these and other Motor Maintenance Products famous for unvarying, top-quality uniformity—used and endorsed by the nation's largest companies. Complete facts on this Ideal line—specifically engineered to substantially reduce high repair costs with simple, low-cost prevention methods—are contained in Catalog Section 4.

Send Coupon for Your Free Copy

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Send Motor Maintenance Products Catalog free:

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Company_____

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SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS

Circle 689 on postcard, page 33

DATA FILE

(Begins on page 256)

ing gages with details on operation. The Liquidometer Corp.

For a copy, circle 413 on Post Card

ELECTRICAL

Electric Motors

Featured in 8-pp Bulletin 2651 are a-c and d-c motors, special motors and gearmotors. Covers applications, ratings, enclosures. The Louis Allis Co.

For a copy, circle 414 on Post Card

Electrical Equipment Data

Collected in this bound catalog is a series of bulletins on electrical equipment, including large (from 250 hp) electric motors, generators, motor-generator sets, switchboards and controls. Cutaway views show design details. The Ideal Electric & Mfg. Co.

For a copy, circle 415 on Post Card

Transformers and Substations

Features and advantages of unit substations incorporating load center transformers and designed for close coupling with high and low voltage switchgear are detailed in 12-pp Bulletin 960. Sorgel Electric Co.

For a copy, circle 416 on Post Card

Distribution Transformers

Dry type distribution transformers, single and three phase, are featured in 16-pp Bulletin 5A2-BL01. Wiring diagrams provided. Acme Electric Co.

For a copy, circle 417 on Post Card

Insulated Transformer Leads

Bulletin RCT 320, 8 pp, describes PVC insulated leads for oil-filled transformers. Discusses insulation properties required for such leads (flexibility, heat stability etc.) and compares these with properties of Synthinol 901. Rome Cable Div.

For a copy, circle 418 on Post Card

Safety Mineral Insulated Cable

Bulletin S-2-60, 20 pp, describes properties, applications, installation, construction and performance characteristics, and wiring specifications of mineral insulated cable for hazardous locations. Mineral Insulated Wire Div., General Cable Corp.

For a copy, circle 419 on Post Card

Rubber Power Cable

This 32-pp catalog contains information on design features, insulations and performance highlights of butyl rubber power cable. Includes data on available constructions, ampacity etc. Anaconda Wire & Cable Co.

For a copy, circle 420 on Post Card

Cable Support Equipment

Described in 28-pp Catalog 5912 are two types of cable trays or tube raceways—the ladder type and the basket small opening type—for cable, wiring and tubing support. Includes dimensions. The Globe Co.

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CONSIDER THESE **FACTS** about REAL RE-SCREENING ECONOMY

1—Rescreening your used rings costs less than buying new rings.

2—Buying SOLID RINGS which can be re-screened MOST often saves MOST dollars in the long run.

MULTI-METAL OFFERS REAL ECONOMY by

1—Re-covering New "Non-Returnable" Rings—or

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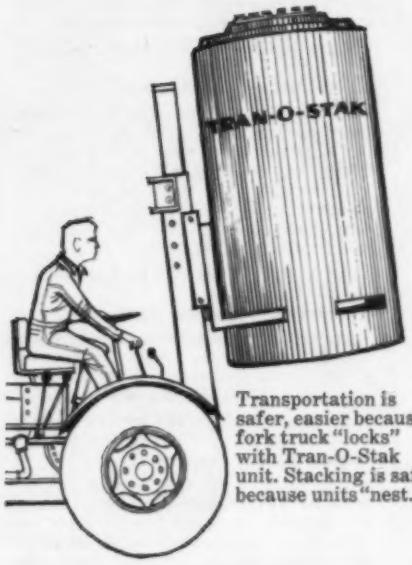
Whichever you choose, let Multi-Metal help you cut replacement costs.

MM MULTI-METAL WIRE CLOTH CO., INC.
1363 Garrison Ave., New York 59, N. Y.

Circle 690 on postcard, page 33

an entirely new concept in TRANSPORTING and STACKING drummed material

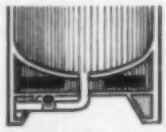


Transportation is safer, easier because fork truck "locks" with Tran-O-Stak unit. Stacking is safe because units "nest."

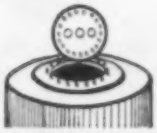
The advent of Tran-O-Stak not only introduces new concepts in handling drummed material, but also eliminates several disadvantages inherent in 55-gallon drums.

Available in 4-, 5-, and 6-drum capacities and intermediate sizes, it utilizes a cleanly cylindrical interior plus discharge through dished or cone bottom to handle **any** flowable material including liquids, semi-liquids, powders and crystals. Write today for complete information.

Tran-O-Stak is moved from any angle without chance of damage to container. No pallets are used. Fork slots totally enclose fork, protecting valve, piping and bottom head.



Flush sides allow complete draining, eliminating compatability problems or contamination. Rugged construction protects lining or coating indefinitely.



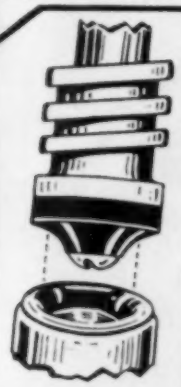
Manhole allows interior inspection, cleaning. Also permits insertion of device for positive agitation before emptying.

Representatives Wanted

TRAN-O-STAK DIVISION | ADVANCE BOILER & TANK CO. | 1711 S. Carferry Dr. | Milwaukee 7, Wis.

Circle 691 on postcard, page 33

Just a Washer?



Yes, but

It's a unique kind of washer which can be the difference between maintenance headaches and smooth, trouble-free operation. There's no equal to GOOD Neoprene Concave Cushion Washers. Concave washer face literally "wraps around" the faucet seat—makes perfect seal even if seat is nicked or corroded. Actual tests prove GOOD Neoprene Cushions withstand high temperatures in excess of 300°.

Use the best. Buy GOOD for the highest quality washers as well as 4,000 other specialties in the GOOD line of plumbing and heating repair parts. Send for Free GOOD sample assortment and 16 page GOOD Catalog "O".

GOOD MANUFACTURING CO., INC.
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Since 1896 GOOD has meant the BEST.

Circle 692 on postcard, page 33

YOUR FREE COPY, SIR

Here's a handy, 24-page guidebook to help you plan the best possible general and local ventilation for your plant. Shows countless installations for all types of industries. Explains how best to exhaust heat and steam, smoke and fumes; how to filter air supply; how to screen out flies. Also tells proper location and size of propeller and centrifugal fans and roof ventilators to use under all operating conditions; how to calculate duct design. For your free copy, WRITE FOR BULLETIN 1522.

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2832 N. Pulaski Road, Chicago 41, Ill.
Offices in 60 Principal Cities

Member of Air Moving and Conditioning Association, Inc. (AMCA)

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Ranges: 15—30—60—100—160—200—300—600 and 1000 lbs. Also 30" vacuum. All gauges 2½" dial; ¼" bottom connection.

A gauge that *fits in*—to a wide range of plant and original equipment uses.

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GAUGES • THERMOMETERS • VALVES

Have you seen the New MARSH "Service Gauge"?

A remarkable new series of 2½" gauges brings you quality, accuracy and stamina—along with REAL economy!

All gauges have strong 2½" bonderized case and brass screwed ring with bevelled glass. All have new Marsh "Read-easy" dial. All are *standard* with Marsh "Recalibrator." Every gauge is guaranteed accurate within 1% of dial reading.

Two types covering wide range of needs available: Type 11 with copper-alloy bourdon tube, silver brazed, and bronze-bushed movement. Type 11S with 316 stainless steel bourdon tube and 303 stainless tip and socket; stainless steel and monel movement.

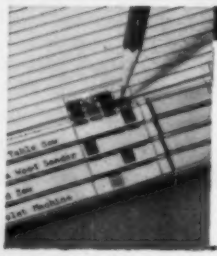
Ask For New Bulletin

MARSH INSTRUMENT COMPANY
Dept. W, Skokie, Ill.
Division of Colorado Oil & Gas Corporation
Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta, Canada, Houston Branch Plant, 1121 Rothwell St., Sect. 15, Houston, Texas. Eastern Seaboard Warehouse: Marsh Instrument Company, 1209 Anderson Ave., Fort Lee, N.J.

Circle 694 on postcard, page 33

Prevent burned out motors that burn up profits

When a dry, forgotten bearing burns out a motor, it can cost thousands of dollars in lost production time. That's why profit-conscious management so often turns to ACME VISIBLE to make preventive maintenance forget-proof. Every need of every motor and machine is visibly scheduled and signaled as shown at right. Service records, cost records, spare parts inventory, stay with maintenance cards. For less down-time and more profitable on-time production, send coupon.



ACME VISIBLE

ACME Visible Records, Inc.
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Crozet, Va.

Please supply more information on Acme Visible money-saving PM control.

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Circle 695 on postcard, page 33

DATA FILE

(Begins on page 256)

Control Batteries

Twelve-pp Bulletin CP-539 describes batteries for control, switchgear and auxiliary power. Illustrates construction details. C & D Batteries, Inc.

For a copy, circle 422 on Post Card

Silicon Charger Selection

Bulletin 6258 incorporates a chart for determining proper silicon-rectifier charger to be used with stand-by batteries. Enables selection of charger according to number of cells to be charged, output amperage, input voltage. Exide Industrial Div., The Electric Storage Battery Co.

For a copy, circle 423 on Post Card

Synchronous Motor Control

Low voltage synchronous motor starting is covered in 12-pp Publication 6092. Includes information on motor control. Allen-Bradley Co.

For a copy, circle 424 on Post Card

Motor Speed Controls

Form 927B, 8 pp, features speed controls for adjustable-speed operation of d-c motors from a-c lines. Lists applications and advantages and explains operation. General Radio Co.

For a copy, circle 425 on Post Card

Electrical Equipment Digest

Presented in 168-pp Catalog Digest 143 are load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

For a copy, circle 426 on Post Card

Enclosed Switches

Catalog 83, 22 pp, Catalog 84, 16 pp, and Catalog 101, 24 pp, cover enclosed switches, including general types for a-c or d-c applications, sealed switches, heavy-duty limit switches, hand operated switches, others. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

For a copy, circle 428 on Post Card

Compact Capacitor Assembly

Engineering Bulletin 4900A describes a motor-start, motor-run capacitor assembly designed to meet requirements of air-conditioning equipment. Sprague Electric Co.

For a copy, circle 429 on Post Card

Guide to Electrical Supplies

This catalog is divided into sections covering wire connectors, electricians' tools, electrical specialties, motor maintenance supplies, blowers and cleaners, wire strippers, soldering equipment. Ideal Industries, Inc.

For a copy, circle 431 on Post Card

Fused Interrupter Switch

Eight-pp Bulletin PSGL features a fused interrupter switch designed to employ current-limiting and overload characteristics of dual-element fuses in low voltage feeders having capaci-

ties to 100,000 rms symmetrical amperes. Pennsylvania Transformer Div., McGraw-Edison Co.

For a copy, circle 432 on Post Card

Control Units

Featured in illustrated 28-pp Publication LO-104 are pushbuttons, indicating lights and selector switches offering compact design, flexibility and durability. Detailed selection data provided. Cutler-Hammer, Inc.

For a copy, circle 434 on Post Card

Aluminum Electrical Fittings

Catalog 61, 38 pp, provides data on aluminum conduit bodies, connectors, couplings, dust-tight fixtures, elbows, fixture hangers, floodlighting, switch fittings, instrument boxes, junction boxes, motor starters, panel boards, others. Killark Electric Co.

For a copy, circle 435 on Post Card

For Corrosive Locations

Twenty-pp Bulletin 2699 describes Condulets for corrosive locations. Corrosive substances are tabulated with appropriate metals and finishes used. Crouse-Hinds Co.

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LIGHTING

Modern Lighting Needs

"Footcandles in Modern Lighting" is a 20-pp booklet giving lighting level recommendations for seeing tasks involved in many activities. Figures based on findings of Illuminating Engineering Research Institute and Illuminating Engineering Society. General Electric Co.

For a copy, circle 438 on Post Card

Lighting Selector

This 24-pp lamp and lighting guide for plant and office lighting, tabulates recommended illumination levels, and tells how to obtain them with fluorescent, mercury or filament lamps. Products of ten manufacturers shows equipment recommended. Graybar Electric Co., Inc.

For a copy, circle 439 on Post Card

Industrial Fluorescent Light

Features and advantages of industrial lighting are described in Bulletin F, 20-pp. Includes illumination data, dimensions, specifications. Benjamin Div., Thomas Industries, Inc.

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Suspension Lighting Duct

Components of a flexible lighting system which suspends and electrically energizes lighting fixtures and small power tools are presented in 36-pp Bulletin ULD-660. Covers suspension equipment, installation, code requirements. BullDog Electric Products Div., I-T-E Circuit Breaker Co.

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HOSE

Industrial Hose Selector

Printed on heavy stock, this handy selector guide for industrial hose can be hung on the wall for easy reference. The Gates Rubber Co.

For a copy, circle 442 on Post Card

Flexible Metal Hose

This 36-pp bulletin gives characteristics and applications of flexible metal hose for a variety of industrial needs. Includes specifications, photos of various types. Pennsylvania Flexible Metallic Tubing Co., Inc.

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FANS, BLOWERS

Square Panel Propeller Fans

Bulletin DB1-106 gives data on fans with capacities to 37,750 cfm. Design, drive and motor features are detailed. Ilg Electric Ventilating Co.

For a copy, circle 444 on Post Card

Guide to Industrial Fans

Performance and design features of Type BL, V-belt and direct drive, and special fans are presented in 75-pp Bulletin F-104-A. Classifications, temperature-altitude chart, fan rating tables, dimensions and other data included. Buffalo Forge Co.

For a copy, circle 445 on Post Card

Direct Connected Fans

Bulletin 690-A, 12 pp, gives dimensions, application and performance data on fans for general and system ventilation and power roof ventilators. Propellair Div., Robbins & Myers, Inc.

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USE PNEUMATICS
TO SOLVE NEW PROBLEMS

—these Bulletins may help you find low-cost solutions

For dependable functioning of products or equipment you build, *use pneumatics!* Often, air "works wonders" unmatched by other methods. It's a versatile, controllable, economical medium of force and power through vacuum and pressure.

For example:

Gast Rotary Air Motors (to 7 h.p.) deliver reversible, variable-speed, explosion-proof power. They're compact — weigh less — cost less.

Gast Compressors (to 30 p.s.i.) supply air blast or pressure to lift, push, mix, atomize, oxidize, pressurize on many jobs.

Gast Vacuum Pumps (to 28" Hg) are used to hold, lift, position and shape parts — to test, control, fill, evacuate — in 101 ways.

Use pneumatics—"Air may be your Answer!"

WRITE FOR "APPLICATION IDEAS" BOOKLET AND CATALOG!

AIR MOTORS • VACUUM PUMPS • COMPRESSORS

GAST MANUFACTURING CORP.

P.O. BOX 117-U, BENTON HARBOR, MICHIGAN

Circle 696 on postcard, page 33

NOW YOU TOO CAN BE SURE!
INSTALL SECO LINE TESTERS
AND MAKE EASY, PERIODIC CHECKS

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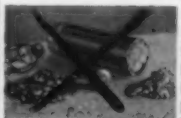

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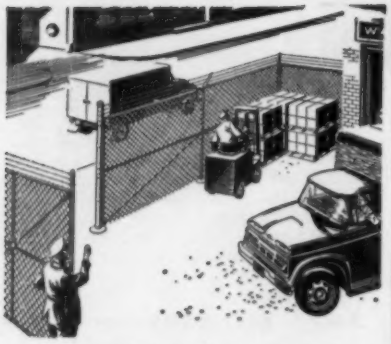

About that property of yours...

PAGE FENCE

These 3 VALUES are important

1. QUALITY is important. When you invest in a fence you want it to last for a long, long time. When you specify PAGE you get 77 years of our experience in the design and manufacture of a quality fence. Page Fence is engineered for long-lasting service and is covered by a Registered Certificate of Quality.

2. WIDE CHOICE is important. For example, we offer a choice of 4 chain link fabrics—ACCO-Aluminized, our latest development, or galvanized steel, stainless, or solid aluminum. Each of these has characteristics which meet individual preferences or make it more suitable to meet certain climatic or service conditions. Furthermore, there are 8 basic fence designs and 6 gate styles. No other company can serve you with so wide a selection.

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Helpful booklet describes fence styles, gates and, components

PAGE FENCE ASSOCIATION
National Headquarters • Monessen, Pa.
A product of Page Steel & Wire Division
American Chain & Cable Co., Inc.
Circle 699 on postcard, page 33

DATA FILE

(Begins on page 256)

Ready-to-Run Units
Catalog 517, 36 pp, provides data on centrifugal fan equipment with capacities included. Clarage Fan Co.

For a copy, circle 447 on Post Card

Make-Up Air Solutions
Bulletin EN-5911 explains how air properly introduced eliminates problems arising when fans draw fumes, smoke or odors. Reznor Mfg. Co.

For a copy, circle 448 on Post Card

Air Moving Equipment
Bulletin DB-45, 20 pp, contains data on roof ventilators, bifurcators, axial flow vent sets, and air jets with ratings. DeBothezat Fans Div., American Machine and Metals, Inc.

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MECHANICAL POWER TRANSMISSION

Variable Speed Belts
Product Bulletin 862 gives detailed information on variable speed belts with arched construction for improved transverse rigidity. The Goodyear Tire & Rubber Co.

For a copy, circle 451 on Post Card

Standard Spring Clutches
Described in this 30-pp catalog are five lines of spring clutches in bore sizes from ⅛ to 1 in., torque capacity to 1250 lb-in. for applications utilizing drive up to 5 hp. Clutches include over-running and back-stopping; indexing; on-off; on-off indexing; and safety lock control. Marquette Div., Curtiss-Wright Corp.

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Heavy-Duty Couplings
Catalog 70, 12 pp, contains engineering and application data on dihedral spindle shaft couplings for mills and allied equipment for metal, paper, rubber, chemical, food industries. Ajax Flexible Coupling Co., Inc.

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Controlled Tensioning
Bulletin 4161 tells how use of drive tensioner eliminates shock loading through excessive chain vibration, and horsepower loss through belt slippage. Brewer Machine & Gear Co.

For a copy, circle 454 on Post Card

Filled Teflon Bearings
Technical Bulletin CP-558 describes filled Teflon bearings for use as radial bearings on vertical pumps. Characteristics of bearing materials given. Chemical & Power Products, Inc.

For a copy, circle 455 on Post Card

Anti-Friction Bearings
Catalog 424-D, 8 pp, gives capsule presentation of company's line of anti-friction bearings, describing each product. SKF Industries, Inc.

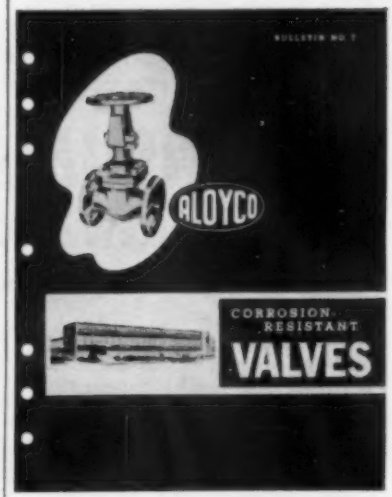
For a copy, circle 456 on Post Card

Write for this

COMPLETE GUIDE TO ALOYCO CORROSION RESISTANT VALVES

It quickly tells you what's available in Aloyco's line of stainless steel and high nickel alloy valves. Cross section illustrations cover 48 basic designs in pressure classes from 150# through 1500# services.

Included is a tabulation of alloy availability by design, and the complete analysis for each material offered. Also



outlined are engineering standards and adaptable features for standard valves.

This brochure summarizes Aloyco's 30 years of specialized experience in the design, development and manufacture of stainless steel valves. Write: Alloy Steel Products Company, 1308 West Elizabeth Ave., Linden, New Jersey.

1.3

Longer Lasting ALOYCO VALVES

ALLOY STEEL PRODUCTS COMPANY
Circle 700 on postcard, page 33

OTHER EQUIPMENT

Keys to Steel Satisfaction

Design, steel selection and heat treatment are described as the keys to optimum economy and material performance in this 77-pp manual of information on increasing endurance limit of steels. Climax Molybdenum Co., Div., American Metal Climax, Inc.

For a copy, circle 457 on Post Card

Finishing Equipment

Contained in this file folder is a series of product bulletins on manual and automatic finishing equipment, including spray guns, nozzles, pumps, tanks, heaters, air compressors, regulators, hose. The De Vilbiss Co.

For a copy, circle 458 on Post Card

Problems of Water Processing

Bulletin A-1, 8 pp, discusses chemistry of coagulation, practical approaches to problems and solutions of water processing, applications of sodium aluminates, refined montmorillonites, cationic, anionic and nonionic polymers. Nalco Chemical Co.

For a copy, circle 459 on Post Card

Water-Cooled Stoker

Design and operating advantages of Vibragrate Stoker are outlined in this illustrated bulletin, with cutaway view. Detroit Stoker Co.

For a copy, circle 460 on Post Card

Condensate Corrosion Control

Advantages of using a film-type amine for controlling corrosion in steam condensate systems are detailed in this product bulletin by Hagan Chemicals & Controls, Inc.

For a copy, circle 461 on Post Card

Piling Rental Service

Details on a piling rental system are presented in 24-pp Catalog 400, including data giving sizes and physical characteristics, dimensional profile drawings, correct applications and illustrations of types of foundations and cofferdams. L. B. Foster Co.

For a copy, circle 462 on Post Card

On Wire Cloth

Case histories of Inco nickel alloy applications in wire cloth, standard weaves, list of 150 chemicals filtered with it, mechanical properties, and physical constants are covered in this 16-pp bulletin. The International Nickel Co., Inc.

For a copy, circle 463 on Post Card

Fighting Corrosion with Corrosion

The principle of the cathodic protection battery for protection of metal surfaces in water tanks, filters, clarifiers, and pipe lines is explained in this 8-pp bulletin by Electro Rust-Proofing Corp.

For a copy, circle 464 on Post Card

Project Engineering Services

Twelve-pp Bulletin 8010 describes engineering services in the development of complete plants on world-wide basis, including laboratory testing, pilot plant demonstration, flowsheet preparation and engineering studies, cost estimates, plant design, erection and construction, training of personnel. Dorr-Oliver Inc.

For a copy, circle 465 on Post Card

Ferrous Metal Products

This ring-bound catalog contains series of booklets on hot rolled sheets and strip, cold rolled sheets and strip, galvanized sheets, enameling iron and Ti-Namel sheets, electrical sheets, hot rolled bars, reinforcing bars, rail steel bars, shapes and bands, tin mill products. Inland Steel Co.

For a copy, circle 466 on Post Card

Product Guide

Booklet 25B6057, 22 pp, shows the wide range of products manufactured by the company, with alphabetical listing and bibliography of literature available on these products. Allis-Chalmers Mfg. Co.

For a copy, circle 468 on Post Card

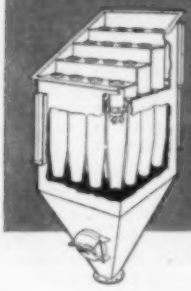
Production Control System

Illustrated and described in 12-pp Bulletin SB-66 are applications of a visible record system for production control—from sales records and market analysis, through engineering design, purchasing, cost, tool and die, etc. Acme Visible Record, Inc.

For a copy, circle 469 on Post Card

Electric Protection Services

Advantages of ADT central station protection service—holdup alarms, watchman supervision, burglar



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EASY-TO-USE: reads rotational or belt speeds directly — no guessing
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Circle 705 on postcard, page 33

DATA FILE

(Begins on page 256)

alarms, automatic and manual fire alarms, sprinkler supervision and waterflow alarms—are detailed in 40-pp Form 948-B. American District Telegraph Co.

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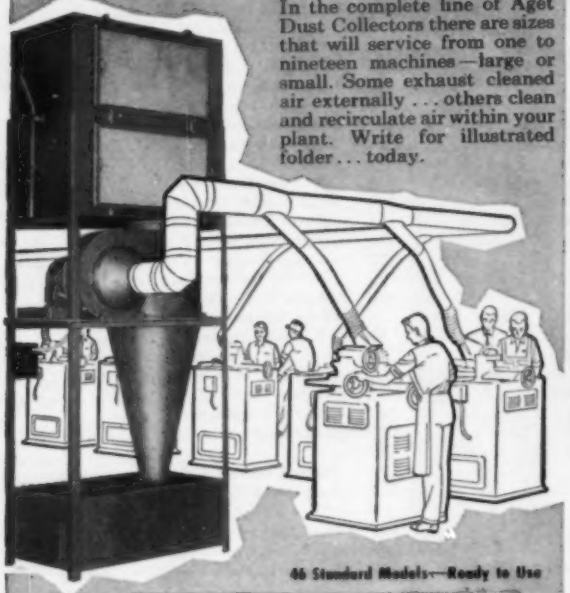
heavy duty unit services up to 19 MACHINES

In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.



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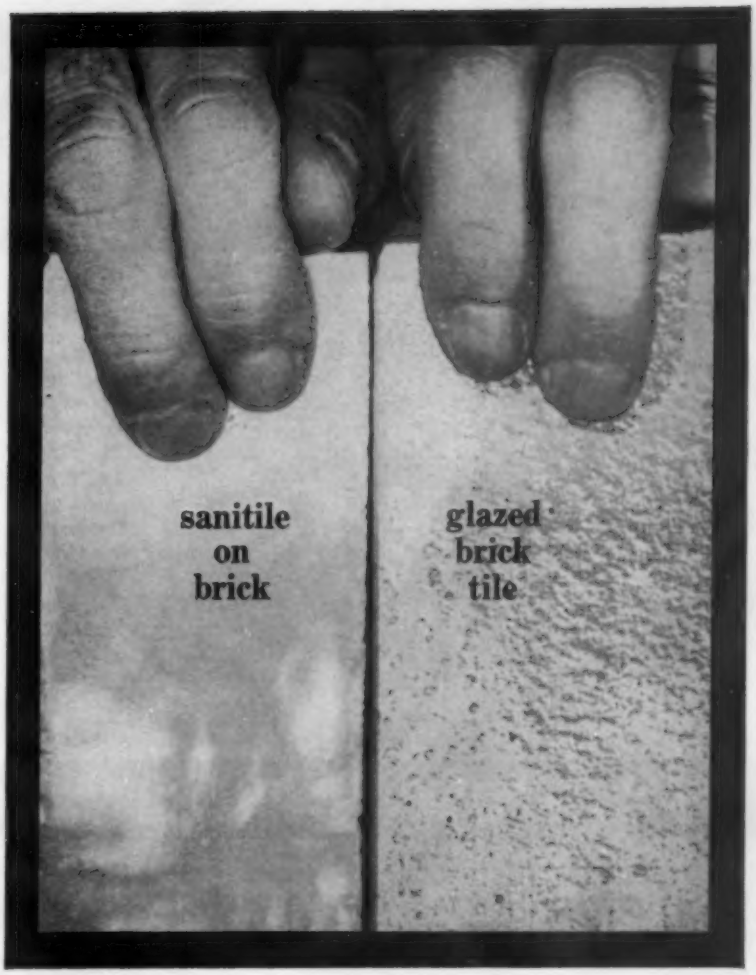

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THE MASTER MECHANICS COMPANY

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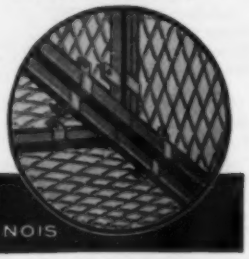
GLOBE SAFE·GARD EXPANDED METAL PARTITIONS with exclusive QUIK-ERECT patented fittings

(FORMERLY HILMAR)

...will answer all your enclosure problems

Here is the new, easier, simpler method of guarding conveyors and machines and for all in-plant partitioning. Shipped READY for erection, no cutting, drilling or welding required . . . these interchangeable expanded metal panels provide greater safety, cut over-all costs, cover a wider range of use and require 85% less storage space.

EXCLUSIVE QUIK-ERECT SECTION CLIPS save much of the erection time formerly required. Proven successful in hundreds of installations, these Safe·Gard panels are of welded construction, give longer life, are more rigid and stronger than wire, will not ravel or fray.



Note enlarged detail showing SAFE·GARD Quik-Erect Clips securely joining the interchangeable panels.

Write today for more details or call your Globe (Grip-Strut) Distributor. Distributors in all principal cities, listed under "Grating" in your phone book.

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PRODUCTS DIVISION | **THE GLOBE COMPANY**
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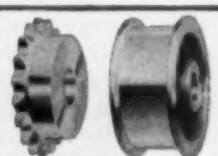
Controlled tensioning eliminates shock loading through excessive chain vibration, and horsepower loss through belt slippage.

- **ROTATING ARM ACTION FOR GREATER ADJUSTMENT**
- **FULL 360° POSITIONING**

A low cost tensioner for single and multiple width drives that is more adaptable to machine frames. *See your Power Transmission Distributor* or write . . .



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One of a series

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Scientists make it known. Engineers make it useful.

Scientists split the atom; engineers design and build the atomic power plants.

All science known would benefit nobody if not applied by engineers to manufacturing, construction, mining, agriculture or the generation of power.

These are the great engineered industries—all based on scientific knowledge.

Engineers plan, design, produce, maintain and *operate.* To repeat: *Scientists make it known. Engineers make it useful.*

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Wayne County Drain Commission, Wyandotte Pumping Station, recently equipped with two new Fairbanks-Morse pumps and motors

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Certificate on File in Cleveland

Certified Fault Protection WITHOUT FUSES!

EC&M Fuseless Starters

ELIMINATE FUSE PROBLEMS & COSTS

Now you can get full fault protection without the problems associated with fuses. EC&M's fuseless starters have certified interrupting capacities of 100,000 KVA at 2400 volts, 150,000 KVA at 4800 volts—an important consideration when starters were selected for the 1250-hp, 4800-volt starters at Wyandotte Pumping Station. This inherent fault protection is an EC&M "exclusive"—and is available with no first-cost premium.

EC&M starters are safe and easy to maintain. A three-way door interlock gives positive personnel protection, and an interlock is provided between the contactor and disconnect switch. Disconnect blades are visible in the open position when the door is open. No roll-out or draw-out needed for maintenance. All six contacts can be replaced without special tools in 10 minutes or so.

These cost-saving features make EC&M starters the logical choice for 2200-4800 volt motor drives.

TYPICAL SAVINGS WITH EC&M STARTERS

	Fused Starter	EC&M Fuseless Starter
Cost of 1250-hp 4800-volt Starter	$xxx.xx	Same as Fused Starter
Spare Fuse Costs: Set of 3 Spare Fuses for 1250 hp	$470.00	0

***SAVE** per starter, up to $500*
(more on larger motors)
...with EC&M Fuseless Starters

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Square D Company, EC&M Division, 4500 Lee Road, Cleveland 28, Ohio

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wherever electricity is distributed and controlled

6520

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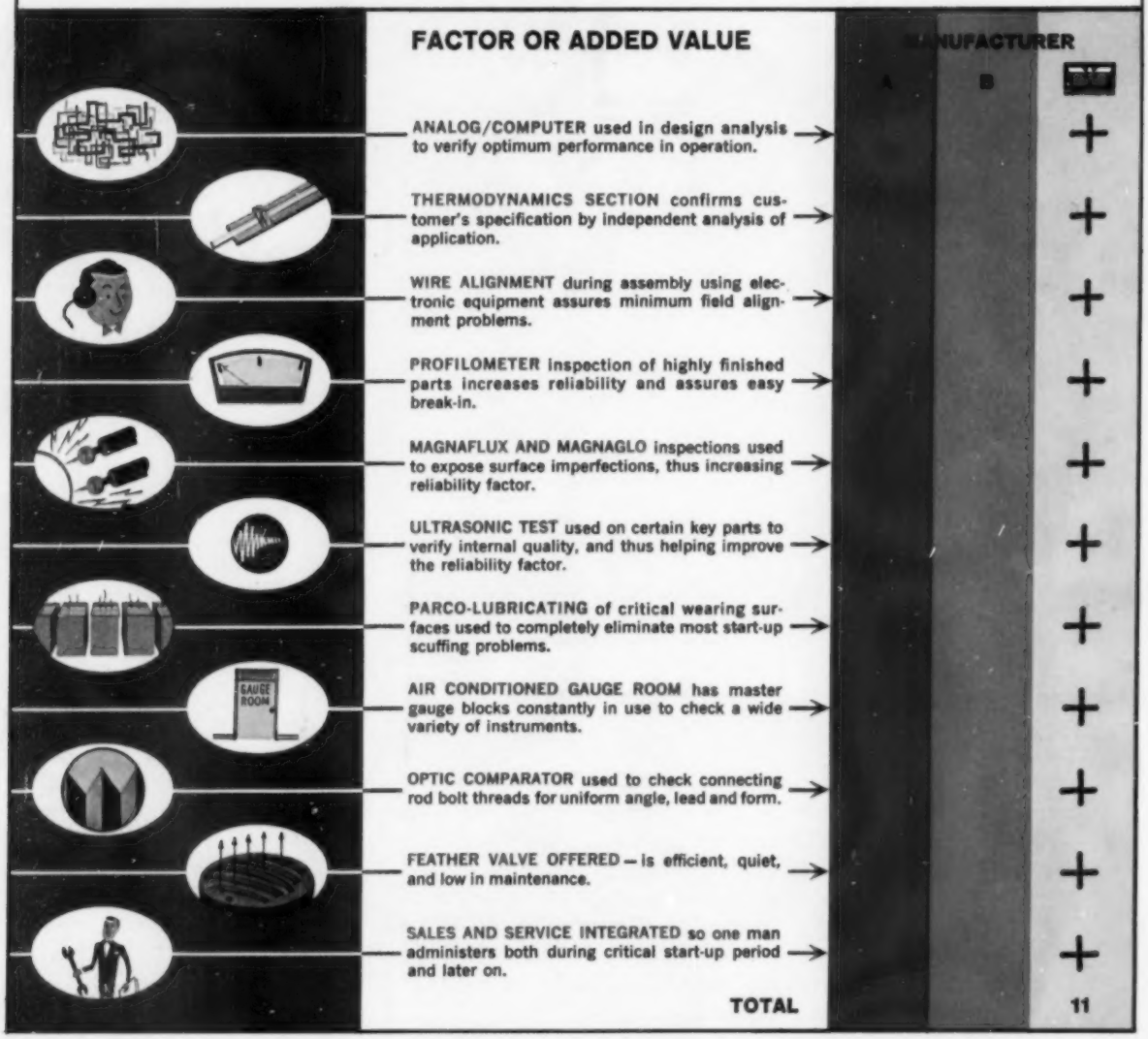
COMPRESSOR QUOTATION EVALUATION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A
B
ANALOG/COMPUTER used in design analysis to verify optimum performance in operation.
THERMODYNAMICS SECTION confirms customer's specification by independent analysis of application.
WIRE ALIGNMENT during assembly using electronic equipment assures minimum field alignment problems.
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AIR CONDITIONED GAUGE ROOM has master gauge blocks constantly in use to check a wide variety of instruments.
GAUGE ROOM
OPTIC COMPARATOR used to check connecting rod bolt threads for uniform angle, lead and form.
FEATHER VALVE OFFERED — is efficient, quiet, and low in maintenance.
SALES AND SERVICE INTEGRATED so one man administers both during critical start-up period and later on.
TOTAL
11

HOW MUCH IS A PRICE?

Above, you see one buyer's check-off of the hidden values buried in a Worthington compressor quotation. It helped indicate the true value of the Worthington offering. But more important than this check-off is the subject involved.

Today's rising costs and minimum profits compel every buyer to scrutinize compressor prices as never before. The problem in determining the true value of an offering is more important and, frequently, more difficult.

What's the answer? For more complete price evaluation, we suggest that you look for the "hidden value" in each manufacturer's offering—in far more detail than above. You can be sure that the true prices will separate very quickly, because "hidden" values vary sharply in the compressor market today.

To help you find, isolate and evaluate compressor offerings, we have prepared an objective "Compressor Evaluation Guide." This booklet points out the six key areas of judgment required for compressor evaluation and details them in full. Ask your Worthington Representative for this booklet or write Worthington Corporation, Dept. 36-17, Clinton Street and Roberts Avenue, Buffalo, N.Y. In Canada, Worthington (Canada) Ltd., Brantford, Ontario.

WORTHINGTON

PRODUCTS THAT WORK FOR YOUR PROFIT

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